DOCUMENT RESUME

| | | |
|---|---|---|
| ED 336 527 | | CE 058 866 |

| | |
|---|---|
| AUTHOR | Martin, Donna; And Others |
| TITLE | Agricultural Science I. Supplementary Units. Instructor Information. |
| INSTITUTION | Missouri Univ., Columbia. Instructional Materials Lab. |
| SPONS AGENCY | Missouri State Dept. of Elementary and Secondary Education, Jefferson City. Div. of Vocational and Adult Education. |
| PUB DATE | Jun 91 |
| NOTE | 361p.; Original document is published on colored papers. |
| AVAILABLE FROM | Instructional Materials Laboratory, University of Missouri, 2316 Industrial Drive, Columbia, MO 65202 (order no. 90-1400-I: $36.35). |
| PUB TYPE | Guides - Classroom Use - Teaching Guides (For Teacher) (052) |
| EDRS PRICE | MF01 Plus Postage. PC Not Available from EDRS. |
| DESCRIPTORS | *Agricultural Education; *Animal Husbandry; Behavioral Objectives; Check Lists; Course Content; Genetic Engineering; Heredity; *Learning Activities; Lesson Plans; Nutrition; Parliamentary Procedures; Postsecondary Education; *Reproduction (Biology); Secondary Education; *Special Needs Students; Student Evaluation; Student Organizations; Teaching Methods; Test Items; Units of Study; *Vocational Education |

ABSTRACT

These supplementary units are designed to help students with special needs learn and apply agricultural skills in the areas of animal breeding, animal nutrition, leadership, and power tools. Specific competencies are listed as study questions at the beginning of each of the 10 self-paced and self-contained units. Skill sheets, activity sheets, and unit tests are provided to reinforce and assess students' knowledge. The units contain large print, simplified text and numerous drawings to aid in comprehension. Units contain the following components: introduction, objectives, study questions, student assessment, terms, information sheets, skill sheets, activity sheets, and unit tests and performance checklists. A section of instructor information at the front of the book contains notes to the instructor, helpful resources, answer keys, competencies, a class progress chart, and a follow-up questionnaire. Units cover the following topics: digestion, basic nutrients, balanced rations, guidelines for feeding livestock, the male and female reproductive systems, heritability, genetic improvement, using a portable electric saw, and parlimentary procedure. (KC)

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90-1400-I

# Agricultural Science I

## SUPPLEMENTARY UNITS

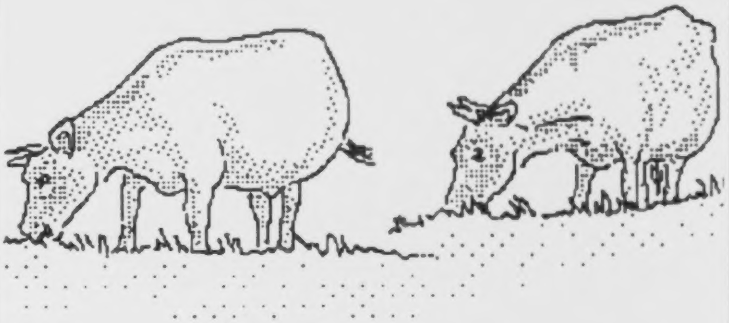
## Instructor Information

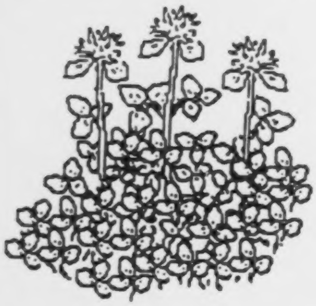
ED336527

**Male Gametes**

**Female Gametes**

|   | X | Y |
|---|---|---|
| X | XX | XY |
| X | XX | XY |





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## SUPPLEMENTARY UNITS

# AGRICULTURAL SCIENCE 1

Written by:

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University of Missouri-Columbia
Columbia, Missouri

June 1991

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Produced by the Instructional Materials Laboratory
University of Missouri-Columbia, Columbia, Missouri 65211

June 1991
Catalog Number 90-1400-I

This activity was supported in whole or in part by funds from the Department of Elementary and Secondary Education, Division of Vocational and Adult Education. However, the opinions expressed herein do not necessarily reflect the position or policies of the Missouri Department of Elementary and Secondary Education or the Division of Vocational and Adult Education, and no official endorsement should be inferred.

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Balanced Rations . . . . . Unit 3
Guidelines for Feeding Livestock . . . . . Unit 4
Male Reproductive System . . . . . Unit 5
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Heritability . . . . . Unit 7
Genetic Improvement . . . . . Unit 8
Using a Portable Electric Saw . . . . . Unit 9
Parliamentary Procedure . . . . . Unit 10

# PREFACE

These supplementary units are designed to help students with special needs learn and apply agricultural skills in the areas of animal breeding, animal nutrition, leadership and power tools.

Specific competencies are listed as "study questions" at the beginning of each of the ten self-paced and self-contained units. Skill sheets, activity sheets and unit tests reinforce and assess the student's growing knowledge. The units contain large print, simplified text and numerous drawings to aid in comprehension.

Each unit within this curriculum is color coded to represent a separate section. Color coding is explained as follows:

| | |
|---|---|
| White: | Introduction, Objectives, Study Questions and Student Assessment. These pages present unit and specific objectives the student must meet to complete the unit successfully. The introduction contains a brief motivational statement describing the purpose and content of the unit. Student Assessment allows the student to determine whether to study the material in the unit or move directly to the unit test. |
| Salmon: | Terms. This section introduces new terms necessary for the student to understand and answer the study questions shown in the unit. These terms appear in bold print in the information sections. |
| Canary: | Information. These pages present detailed information and explanations for each study question. |
| Green: | Skill Sheets. These pages provide paper-and-pencil exercises to develop and reinforce the skills presented in the unit. |
| Blue: | Activity Sheets. Various activities are presented to increase student involvement and provide extra practice in performing the procedures. |
| Pink: | Unit Test and Performance Checklist. These pages are used by the instructor to evaluate student performance. Different forms of review, including identification, matching, multiple-choice and short-answer exercises are provided. |

"Instructor information," located at the front of the book, contains notes to the instructor, helpful resources and answer keys.

## ACKNOWLEDGEMENTS

These supplementary units for Agricultural Science 1 represent the combined efforts of the following individuals:

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## GENERAL NOTES TO THE INSTRUCTOR

**Step 1:** Read through the information in each unit before presenting it to the student.

**Step 2:** Make sure all equipment to be used in each unit is available.

**Step 3:** Provide student with the Introduction pages.

**Step 4:** Discuss the Introduction and Objectives on the Introduction pages.

**Step 5:** Have the student complete the "Are You Ready?" section.

**Step 6:** If the student elects to complete the Unit Test and Performance Checklist and does so to your satisfaction, have him or her proceed to the next unit.

**Step 7:** Discuss the study questions with the student. Also discuss the terms.

**Step 8:** Provide the student with the Information section.

**Step 9:** Select a means to present the Information section.

A. Have the student study the information independently.
B. Go through the information as a group.
C. Go through the meaterial as a group; then have students work independently.

**Step 10:** Give the student time to learn the information. (You, the instructor, decide how much time the student needs.)

**Step 11:** Have the student complete all the Skill Sheets. Skill Sheets reinforce skills necessary to understand and apply the information in the unit. They may also be used by the student as a self-evaluation tool or by the class as a discussion aid.

**Step 12:** Complete Activity Sheets.

**Step 13:** When the student is ready, use the Unit Test and Performance Checklist to evaluate the student's performance for each unit.

## REFERENCES

1. Blakely, James and David H. Bade. The Science of Animal Husbandry. Reston Publishing Company, Inc. Reston, VA: 1976.
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SUPPLEMENTARY UNITS, AGRICULTURAL SCIENCE 1

## COMPETENCIES

Competencies developed in these supplementary units are based on selected areas of the Agricultural Science 1 competency profile, 1987 revision.

| | | |
|---|---|---|
| Rating Scale: | 3 | Mastered--can work independentaly with no supervision |
| | 2 | Requires Supervision--can perform job completely with limited supervision |
| | 1 | Not Mastered--requires instruction and close supervision |
| | N | No Exposure--no experience or knowledge in this area |

**Animal Nutrition**

1. Compare the digestive systems of ruminants and non-ruminants and determine how the differences between them affect feeding practices (Unit 1)

2. List the basic nutrient requirements and six elements of a ration (Unit 2)

3. Balance a simple ration (Unit 3)

4. List common rules of thumb for feeding livestock (Unit 4)

**Animal Breeding**

1. Identify and describe the function of the parts of the male reproductive system in cattle and swine (Unit 5)

2. Identify and describe the function of the parts of the female reproductive system in cattle and swine (Unit 6)

3. Describe the heritability of traits in animals (Unit 7)

4. Describe procedures for making genetic improvements in livestock (Unit 8)

**Woodworking**

8. Select and adjust the portable electric saw to cut wood safely (Unit 9)

**Leadership**

7. Use parliamentary procedure in chapter and committee meetings (Unit 10)

## Class Progress Chart

| Student Name | | | | | | | | | | WHAT THE STUDENT CAN DO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Compare the digestive systems of ruminants and nonruminants and determine how the differences between them affect feeding practices |
| | | | | | | | | | | List the basic nutrient requirements and six elements of a ration |
| | | | | | | | | | | Balance a simple ration |
| | | | | | | | | | | List common rules of thumb for feeding livestock |
| | | | | | | | | | | Identify and describe the function of the parts of the male reproductive system in cattle and swine |
| | | | | | | | | | | Identify and describe the function of the parts of the female reproductive system in cattle and swine |
| | | | | | | | | | | Describe the heritability of traits in animals |
| | | | | | | | | | | Describe procedures for making genetic improvements in livestock |
| | | | | | | | | | | Select and adjust the portable electric saw to cut wood safely |
| | | | | | | | | | | Use parliamentary procedure in chapter and committee meetings |

## Special Needs Follow-Up Questionnaire

Staff members, writers and advisors have worked to make these instructional materials easy--both to use and to read. We welcome your suggestions and/or corrections. Please return this questionnaire with your comments to:

Special Needs Editor
Instructional Materials Laboratory
8 London Hall
University of Missouri-Columbia
Columbia, Missouri 65211

Thank you for your time and consideration.

---

Supplementary Units for

### Agricultural Science 1

My overall rating of this publication is:

Excellent Very Good Good Fair Poor

To improve the materials, IML should:

________________________________________

________________________________________

________________________________________

________________________________________

Other Comments:

________________________________________

________________________________________

________________________________________

Optional:

Name:____________________________

Address:__________________________

__________________________________

SUPPLEMENTARY UNITS, AGRICULTURAL SCIENCE 1

# ANSWER KEY

## GENETIC IMPROVEMENT

### SKILL SHEET 1

1. L
2. M
3. H
4. estimate, likely
5. used
6. milk production
7. 25
8. 25 - 50
9. 50

### SKILL SHEET 2

1. F
2. F
3. T
4. T
5. T
6. F

### SKILL SHEET 3

Instructor's discretion

### UNIT TEST

1. C
2. B
3. B
4. A
5. C
6. B
7. C
8. M
9. L
10. M
11. H
12. M
13. L
14. H
15. M

## DIGESTION

### SKILL SHEET I

1. R
2. N
3. N
4. N
5. N
6. R
7. N
8. R

Part 2.

9. A
10. C
11. B
12. A
13. B

### SKILL SHEET 2

1. mouth
2. esophagus
3. cecum
4. large intestine
5. rectum
6. anus
7. small intestine
8. stomach
9. anus
10. esophagus
11. mouth
12. stomach
13. rectum
14. small intestine
15. cecum
16. large intestine

### SKILL SHEET 3

1-4. Pigs, horses, rabbits, poultry

5. Poultry
6. Pigs
7. Horses and rabbits

### SKILL SHEET 4

1. carbohydrates, fats and oils, proteins, vitamins, minerals, and water
2. carbohydrates, fats, proteins, vitamins and minerals
3. corn, wheat, oats, barley, rye and sorghum
4. grass and hay

### SKILL SHEET 5

1. roughage, cecum
2. feces, digestion
3. Xs on the horse and rabbit

### SKILL SHEET 6

1. reticulum
2. abomasum
3. omasum
4. rumen

### SKILL SHEET 7

1. 4
2. 5
3. 1
4. 9
5. 2
6. 7
7. 3
8. 6
9. 8

### SKILL SHEET 8

1. Eat lots of roughage, chew their cuds
2. cattle, goats, sheep
3. hay, pasture grasses, silage
4. corn, barley, sorghum
5. protein supplements (concentrates)

### SKILL SHEET 9

1. roughage
2. chew
3. nonruminant's, 40 to 60
4. 3 to 4, 1 1/2 to 2
5. Bacteria, nutrients

SUPPLEMENTARY UNITS, AGRICULTURAL SCIENCE 1

# ANSWER KEY

## DIGESTION

### UNIT TEST

1. Nonruminants have simple stomachs that cannot hold as much food as ruminants. (Horses and rabbits can eat roughage because of the action of the cecum.) Ruminants have several stomachs. They can store much roughage and regurgitate it later. They chew their cuds.
2. Cattle, goats, sheep
3. Hay pasture grasses, grains, and protein concentrates
4. Reticulum, rumen, omasum, abomasum
5. T
6. T
7. F
8. F
9. T
10. T
11. T
12. T
13. F
14. T
15. F
16. Pigs, horses, rabbits, poultry
17. Grains and hay and grass.
18. Enlarged cecum aid in digesting roughage.
19. Horses and rabbits
20. Animals that ruminate can eat large amounts of grass and hay. Nonruminating animals eat mostly grains.
21. Mouth
22. Esophagus
23. Cecum
24. Large intestine
25. Rectum
26. Anus
27. Small intestine
28. Stomach

## BASIC NUTRIENTS

### UNIT TEST

1. D
2. F
3. B
4. C
5. E
6. A
7. E
8. C
9. A
10. B
11. F
12. D
13. B
14. E
15. A
16. B
17. E
18. A
19. A
20. B
21. B
22. F
23. F
24. F
25. T

## BASIC NUTRIENTS

### SKILL SHEET I

These six in any order

1. Carbohydrates
2. Fats
3. Proteins
4. Minerals
5. Vitamins
6. Water
7. c
8. a
9. d
10. d
11. d
12. e
13. b
14. b
15. a
16. f

### SKILL SHEET 2

1. e
2. c
3. a
4. b
5. f
6. d

### SKILL SHEET 3

1. b
2. e
3. d
4. b
5. e
6. a
7. a
8. b
9. b

### SKILL SHEET 4

1. Doe's milk only
2. Weaned bunnies
3. Free choice concentrates, 40% hay
4. Ration 2

### SKILL SHEET 5

These six in any order

1. Maintenance
2. Growth
3. Fattening
4. Production
5. Reproduction
6. Work
7. F
8. F
9. F
10. T

# ANSWER KEY

## USING A PORTABLE ELECTRIC SAW

### SKILL SHEET 1

| | |
|---|---|
| 1. | B |
| 2. | A |
| 3. | A |
| 4. | B |
| 5. | B |
| 6. | A |
| 7. | A |

8 & 9
Instructor's
discretion

### SKILL SHEET 2

| | |
|---|---|
| 1. | B |
| 2. | A |
| 3. | F |
| 4. | H |
| 5. | D |
| 6. | C |
| 7. | I |
| 8. | G |
| 9. | E |

### SKILL SHEET 3

| | |
|---|---|
| 1. | A |
| 2. | B |
| 3. | B |
| 4. | B |
| 5. | B |
| 6. | A |
| 7. | B |
| 8. | A |
| 9. | C |
| 10. | C |
| 11. | A |
| 12. | B |

### SKILL SHEET 4

| | |
|---|---|
| 1. | bad |
| 2. | good |
| 3. | bad |
| 4. | bad |
| 5. | good |
| 6. | good |
| 7. | bad |
| 8. | good |
| 9. | D |
| 10. | B |
| 11. | B |
| 12. | D |
| 13. | D |
| 14. | D |
| 15. | C |
| 16. | C |

### SKILL SHEET 5

| | |
|---|---|
| 1. | unsafe |
| 2. | unsafe |
| 3. | unsafe |
| 4. | safe |
| 5. | unsafe |
| 6. | unsafe |
| 7. | safe |
| 8. | unsafe |
| 9. | unsafe |
| 10. | safe |
| 11. | unsafe |

### UNIT TEST

| | |
|---|---|
| 1. | F |
| 2. | F |
| 3. | T |
| 4. | F |
| 5. | F |
| 6. | T |
| 7. | T |
| 8. | T |
| 9. | F |
| 10. | T |
| 11. | T |
| 12. | F |
| 13. | F |
| 14. | T |
| 15. | T |
| 16. | T |
| 17. | T |
| 18. | B |
| 19. | D |
| 20. | C |
| 21. | A |
| 22. | B |
| 23. | E |
| 24. | G |
| 25. | I |
| 26. | C |
| 27. | D |
| 28. | H |
| 29. | F |
| 30. | A |

## PARLIAMENTARY PROCEDURE

### SKILL SHEET 1

| | |
|---|---|
| 1. | B |
| 2. | A |
| 3. | A |
| 4. | B |
| 5. | A |
| 6. | A |

### SKILL SHEET 2

| | |
|---|---|
| 1. | 6 |
| 2. | 3 |
| 3. | 7 |
| 4. | 1 |
| 5. | 5 |
| 6. | 2 |
| 7. | 4 |
| 8. | agenda |

### SKILL SHEET 3

| | |
|---|---|
| 1. | B |
| 2. | A |
| 3. | A |

### SKILL SHEET 4

Instructor's
discretion

### SKILL SHEET 5

| | |
|---|---|
| 1. | 3 |
| 2. | 6 |
| 3. | 7 |
| 4. | 1 |
| 5. | 8 |
| 6. | 2 |
| 7. | 4 |
| 8. | 5 |
| 9. | 9 |
| 10. | 10 |

### SKILL SHEET 6

| | |
|---|---|
| 1. | B |
| 2. | C |
| 3. | D |
| 4. | A |

### SKILL SHEET 7

| | |
|---|---|
| 1. | T |
| 2. | T |
| 3. | F |
| 4. | T |
| 5. | T |
| 6. | T |
| 7. | T |
| 8. | F |
| 9. | T |
| 10. | T |
| 11. | F |
| 12. | T |
| 13. | T |
| 14. | F |

## PARLIAMENTARY PROCEDURE

### UNIT TEST

| | |
|---|---|
| 1. | F |
| 2. | F |
| 3. | T |
| 4. | F |
| 5. | T |
| 6. | F |
| 7. | T |
| 8. | T |
| 9. | F |
| 10. | F |
| 11. | I |
| 12. | G |
| 13. | F |
| 14. | B |
| 15. | L |
| 16. | C |
| 17. | J |
| 18. | H |
| 19. | K |
| 20. | E |
| 21. | A |
| 22. | D |
| 23. | I |
| 24. | move |
| 25. | that |

# ANSWER KEY

## FEMALE REPRODUCTIVE SYSTEM

### SKILL SHEET 1

1. A
2. C
3. C
4. B
5. B
6. A
7. B
8. C
9. A

### SKILL SHEET 2

1. B
2. A
3. A
4. C
5. B
6. A
7. B
8. C
9. A

### UNIT TEST

1. right uterine horn
2. uterus
3. fallopian tube
4. infundibulum
5. cervix
6. urethral opening
7. vulva
8. clitoris
9. vagina
10. bladder
11. ovary
12. cotyledons
13. left uterine horn
14. F
15. T
16. T
17. F
18. F
19. F
20. F
21. B
22. C
23. D
24. B
25. D

## MALE REPRODUCTION

### SKILL SHEET 1

1. C
2. B
3. A
4. B
5. A
6. A
7. B
8. B
9. C

### SKILL SHEET 2

1. C
2. B
3. A
4. B
5. A
6. B
7. C

### SKILL SHEET 3

1. Bull, Boar
2. A

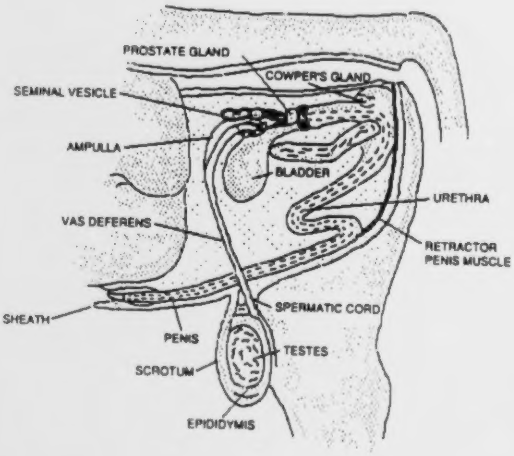
### ACTIVITY SHEET 1

Instructor's discretion

### UNIT TEST

1. - 13. (Diagram)

14. F
15. F
16. F
17. T
18. F
19. F
20. C
21. A
22. D
23. B
24. b


PROSTATE GLAND
COWPER'S GLAND
SEMINAL VESICLE
AMPULLA
BLADDER
URETHRA
VAS DEFERENS
RETRACTOR PENIS MUSCLE
SPERMATIC CORD
SHEATH
PENIS
TESTES
SCROTUM
EPIDIDYMIS

# ANSWER KEY

## GUIDELINES FOR FEEDING LIVESTOCK

### SKILL SHEET 1

1. B
2. A
3. A
4. B
5. A
6. A
7. B
8. A
9. differ, nutrients
10. age, purpose
11. specific, leaving some out, supplying to much
12. desired performance, least cost

### SKILL SHEET 2

1. 0
2. 1.06
3. 7
4. 13.2
5. 19

### SKILL SHEET 3

1. B because baby animals need more nutrients than adult animals
2. A because working animals need more nutrients than resting animals
3. B because large animals need more nutrients than smaller ones
4. B because animals giving milk need more nutrients than dry animals

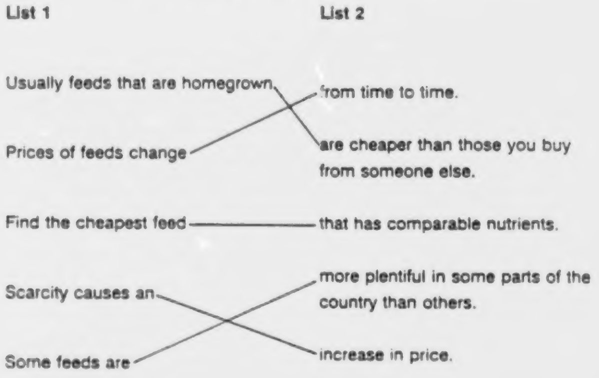
### SKILL SHEET 4

1. cattle
2. cattle
3. swine
4. cattle
5. sheep & goats
6. swine
7. poultry
8. horses
9. poultry
10. poultry

### UNIT TEST

1. Species differ in nutrient requirements.
2. Nutrient needs change with the age of the animal and the desired objective.
3. Specific nutrients are required--don't give too much or too little.
4. Many nutrient sources are available. Choose feed to get the desired performance with the least cost.
5. T
6. T
7. F
8. F
9. F
10. T
11. T
12. F
13. F
14. T
15. T
16. F
17. T
18. F
19. F
20. T

### SKILL SHEET 5



| List 1 | List 2 |
|---|---|
| Usually feeds that are homegrown | from time to time. |
| Prices of feeds change | are cheaper than those you buy from someone else. |
| Find the cheapest feed | that has comparable nutrients. |
| Scarcity causes an | more plentiful in some parts of the country than others. |
| Some feeds are | increase in price. |

# ANSWER KEY

## BALANCED RATIONS

### SKILL SHEET 1

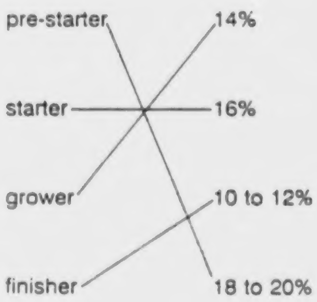
1. protein
2. body tissue
3. amino acids
4. 25
5. 3 or 4, 14 or 15
6. enzyme action
7. hormones
8. metabolism
9. tissue
10. nitrogen, amino acids

### SKILL SHEET 2

1. A & B
2. F
3. G
4. C
5. E
6. N
7. 0
8. I
9. H
10. J
11. M
12. L
13. K

Part 2.

| Stage of growth | Protein requirement |
|---|---|



### SKILL SHEET 3

1. B
2. C
3. D
4. A
5. B
6. C
7. B
8. A
9. D
10. B
11. A
12. C
13. A
14. D
15. B

### SKILL SHEET 4

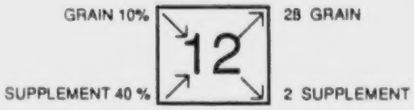
CHART

| Nutrient | Alfalfa Hay Sun-Cured 1/10 Bloom Stage | Fescue Mid-maturity Stage |
|---|---|---|
| Crude Protein % | 16.7 | 9.20 |
| Net Energy, Therms/lb. | 0.55 | 0.40 |
| Calcium % | 1.66 | 0.28 |
| Phosphorus % | 0.24 | 0.28 |
| Crude Fiber% | 31.50 | 36.60 |
| Total Digestible Nutrients | 54.00 | 40.00 |

| | |
|---|---|
| red clover, | crude protein, 14.9%<br>vitamin A, 13 |
| corn fodder, | crude protein, 8.9 %<br>vitamin A, 2 |

### SKILL SHEET 5

PEARSON SQUARE



Add the two right-side numbers. 28 + 2 = 30

This means that in 30 pounds of feed there would be 28 pounds of grain and 2 pounds of supplement.

Now find how many pounds of grain and how many pounds of supplement you would need to make 100 pounds of feed.

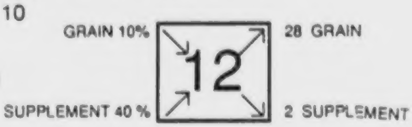
28/30 times 100 = 93.3 lbs. grain
2/30 times 100 = 6.7 lbs. supplement

# ANSWER KEY

## BALANCED RATIONS

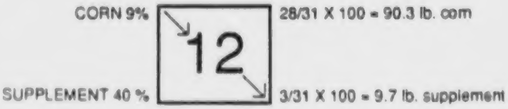
### SKILL SHEET 6

1. Grain #1 - Milo has 10.5% crude protein (2 X 10.5) = 21
   Grain #2 - Corn has 9.0% crude protein (1 X 9.0) = 9
2. Average = 30 divided by 3 = 10
3. Pearson Square
4. Add right sides (28 + 2) = 30
5. 63.2 lbs. milo; 31.1 lbs. corn


GRAIN 10%
28 GRAIN
12
SUPPLEMENT 40 %
2 SUPPLEMENT

### UNIT TEST

1. A ration is the total amount an animal eats in a day.
2. A balanced ration contains all the six nutrients in proper amounts.
3. T
4. T
5. F
6. T
7. T
8. C
9. D
10. B
11. B
12. Pearson Square


CORN 9%
28/31 X 100 = 90.3 lb. corn
12
SUPPLEMENT 40 %
3/31 X 100 = 9.7 lb. supplement

Check the mixture for protein
90.3 lb. corn times .09 = 8.13

9.7 lb. sup. times .40 = 3.88
12.01

## HERITABILITY

### SKILL SHEET 1

1. B
2. C
3. C
4. A
5. & 6. Teacher's discretion

### SKILL SHEET 2

1. B
2. A
3. D
4. C
5. C
6. B
7. B
8. C

### SKILL SHEET 3

1. cells
2. p
3. dominant
4. pairs
5. heritability
6. P
7. recessive
8. recessive
9. chromosomes
10. dominant

### SKILL SHEET 4

1. B
2. A
3. C
4. A
5. C

### SKILL SHEET 5

1. C
2. D
3. B
4. A
5. E

### SKILL SHEET 6

1. incomplete dominance
2. red
3. white
4. red, roan, white

### SKILL SHEET 7

Male

Female

| | B | b |
|---|---|---|
| B | BB | Bb |
| b | Bb | bb |

Three will be black.
One will be brown.

19

# ANSWER KEY
## HERITABILITY

### SKILL SHEET 8

1. male
2. checkerboard
3. mother
4. heterozygous
5. incomplete dominance
6. female
7. phenotype
8. father
9. homozygous
10. genotype

### ACTIVITY SHEET 1

**Male Gametes**

| Female Gametes | | X | Y |
|---|---|---|---|
| | X | XX | XY |
| | X | XX | XY |

**Male Gametes**

| Female Gametes | | R | W |
|---|---|---|---|
| | R | RR | RW |
| | W | RW | WW |

**Male Gametes**

| Female Gametes | | P | p |
|---|---|---|---|
| | P | PP | Pp |
| | p | Pp | pp |

### UNIT TEST

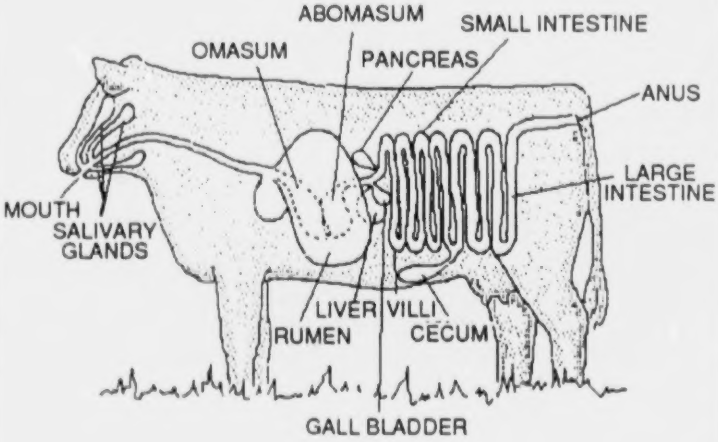
1. T
2. F
3. T
4. T
5. F
6. F
7. F
8. T
9. B
10. A
11. D
12. D
13. B
14. A
15. C

90-1400-S

# Agricultural Science I

SUPPLEMENTARY UNITS

## Digestion


ABOMASUM
SMALL INTESTINE
OMASUM
PANCREAS
ANUS
LARGE INTESTINE
MOUTH
SALIVARY GLANDS
LIVER
VILLI
RUMEN
CECUM
GALL BLADDER

QUALITY
FEED

Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

## DIGESTION

# INTRODUCTION

One way we classify animals is by the way they digest their food. Farm animals have two general types of digestive systems. Cattle, sheep and goats are called "ruminants." Swine, poultry, horses and rabbits are "nonruminants." Understanding the difference between ruminants and nonruminants will help you feed livestock properly.

# OBJECTIVES

After you complete this unit, you should be able to classify common farm animals as ruminant or nonruminant and explain how the digestive system determines what animals should eat.

# STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. How are ruminants and nonruminants different?
2. What are the parts of the nonruminant digestive system?
3. Which common farm animals are nonruminants?
4. What foods do nonruminants usually eat?

5. Why can some nonruminants use large amounts of roughage (hay)?
6. Which nonruminants use large amounts of roughage?
7. What are the different parts of the ruminant digestive system?
8. How does the rumination process work?
9. Which common farm animals are ruminants?
10. What foods do ruminants usually eat?
11. How does an animal's digestive system affect feeding habits?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

## A. TERMS

1. **Absorb** - (ab-sorb) to take nutrients from digested food and transfer them to the bloodstream.
2. **Digestion** - (di-gest-shun) process of breaking down food into simple substances the body can use.
3. **Concentrates** - (con-cen-trates) foods low in fiber and high in nutrients. Grains are concentrates.
4. **Fiber** - (fi-ber) thread-like tissue in foods that are a bit hard to digest.
5. **Monogastric** - (mo-no-gas-tric) simple, one-compartment stomach.
6. **Regurgitate** - (re-gurg-a-tate) bring back from the stomach into the mouth.
7. **Roughage** - (ruf-age) fibrous foods such as grass and hay.
8. **Supplements** - (sup-le-ments) feed made from plant or animal by-products (containing 20 percent or more protein).

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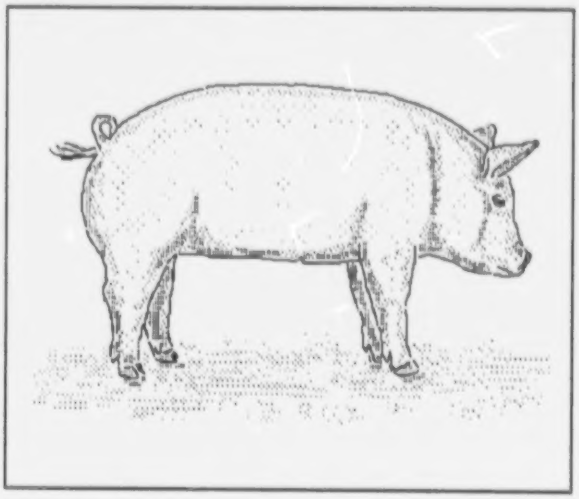
## B. HOW ARE RUMINANTS AND NONRUMINANTS DIFFERENT?

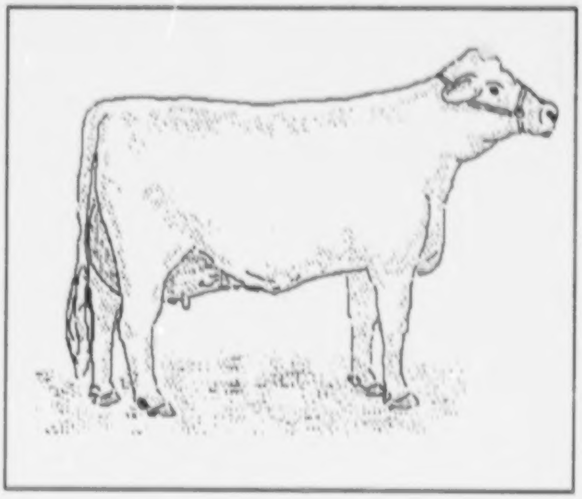
**Digestion** is the way animals break down food into simple substances that their bodies can **absorb**. **Digestion** begins in the mouth and ends with the anus (vent in poultry). Animals digest their foods in two different ways.

1. Animals that have simple one-compartment (**monogastric**) stomachs are nonruminants. Pigs are nonruminant animals. So are horses, poultry and rabbits. You are a nonruminant animal. You have a simple, one-compartment stomach.



2. Animals with several compartments to their stomachs are ruminants. They graze, but chew their

food very little. It goes from the mouth into the rumen. You'll learn more about this in another section. Later this food mixed with saliva returns to the mouth. Now they chew it thoroughly. It's called chewing their cud. Cows are ruminants. So are sheep and goats. You chew gum, but not your cud. You are not a ruminant animal.



Most parts of both digestive systems are the same. However, ruminants have more complex stomachs than nonruminants.

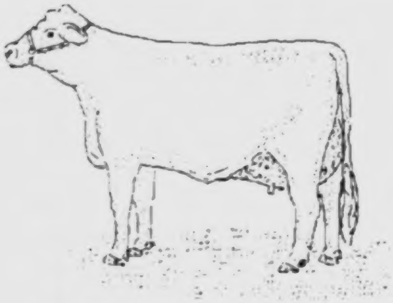
**DO SKILL SHEET 1**

DIGESTION

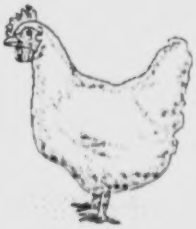
# SKILL SHEET 1

Part 1. On the line beside each picture, write an (R) is it is a ruminant or an (N) if it is a nonruminant.

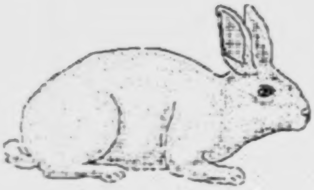
___1.



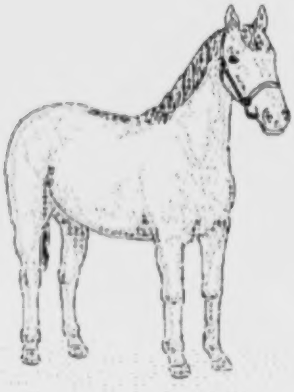
___2.



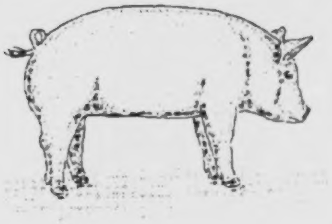
___3.



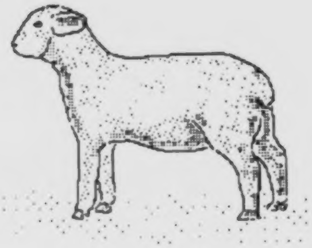
___ 4.



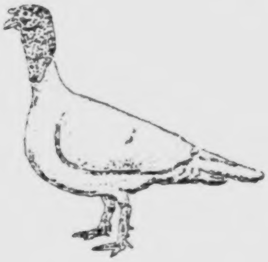
___ 5.



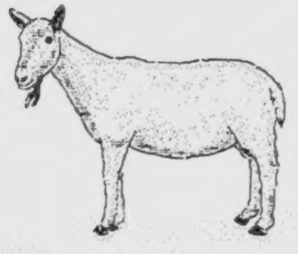
___ 6.



___ 7.



___ 8.



Part 2. Choose the answer that correctly completes each statement.

___ 9. Ruminants

a. chew their cuds.

b. are larger than nonruminants.

c. are hard to care for.

28

___10. Ruminants

a. don't have teeth.

b. have simple, one-compartment stomachs.

c. have several compartments to their stomachs.

___11. Nonruminants

a. chew their cuds.

b. have simple, one-compartment stomachs.

c. are picky eaters.

___12. Ruminants have

a. more parts to their stomachs than nonruminants.

b. simple, one-compartment stomachs.

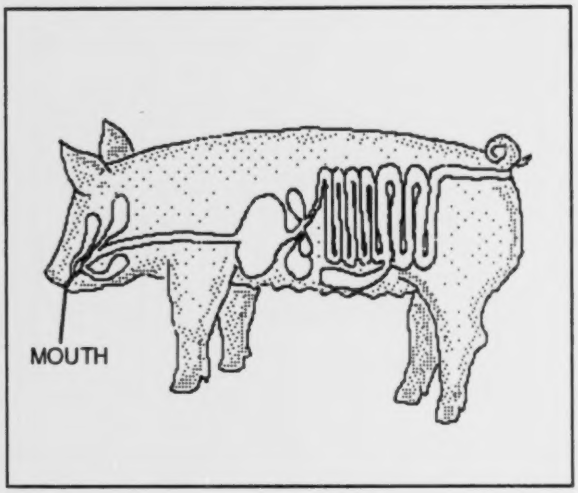
c. the same kind of digestive system as nonruminants.

___13. You are a

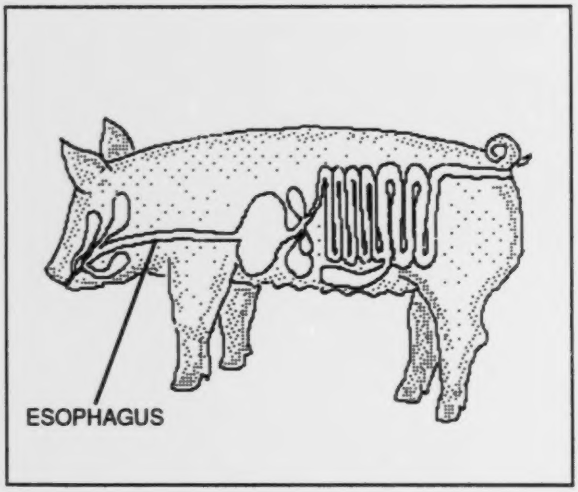
a. ruminant.

b. nonruminant.

## C. WHAT ARE THE PARTS OF THE NONRUMINANT DIGESTIVE SYSTEM?



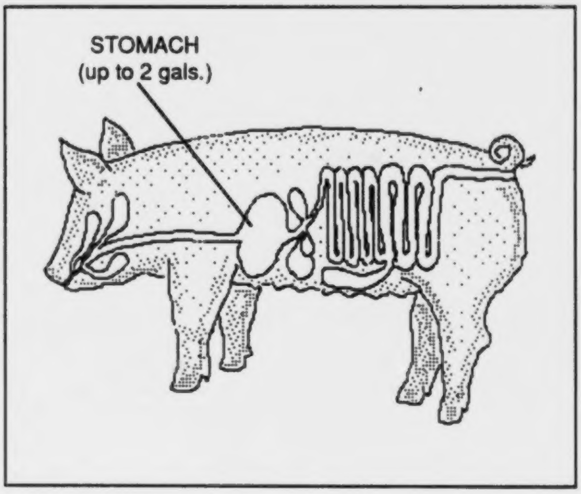
1. **Mouth**. **Digestion** starts in the mouth. The teeth and tongue work together to tear and break up the food. Saliva mixes with the food adding moisture and chemicals to start processing it for use by the animal's body.

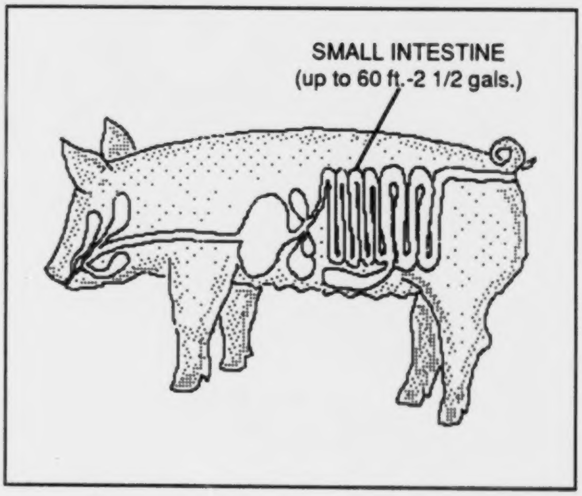


2. **Esophagus**. Food passes from the mouth into the esophagus (gullet). The esophagus is a tube leading to the stomach. It has a squeezing wave motion that pushes the food along. At the entrance to the stomach a little valve called the cardia

closes behind the food as it moves into the stomach. The cardia doesn't let food come back the wrong way into the esophagus.

3. **Stomach**. When the food reaches the stomach, digestive juices flood it. These digestive juices contain acid that helps break down the food. The juices also contain enzymes that help change raw food into material that can be passed into the bloodstream and used by the body.

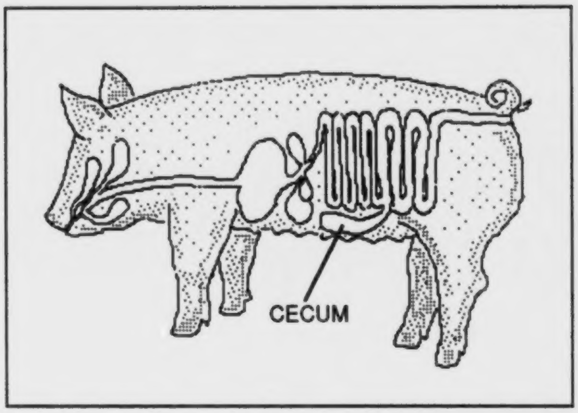




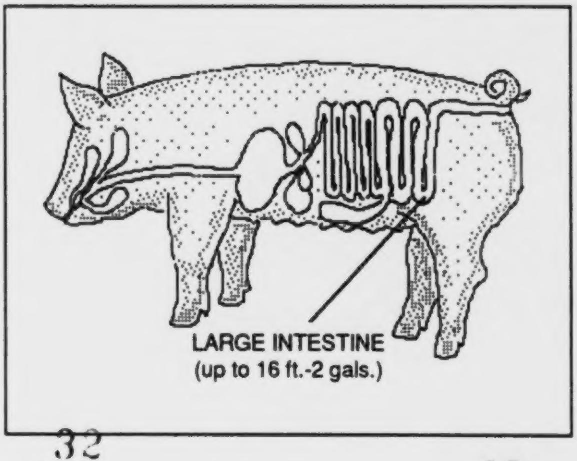
4. **Small intestine**. Some of the food is digested in the stomach, but most of it moves on to the small intestine. Here the liver,

gallbladder, pancreas and other body organs add more digestive juices. Most of the nutrients from the food are **absorbed** into the body from the small intestine.

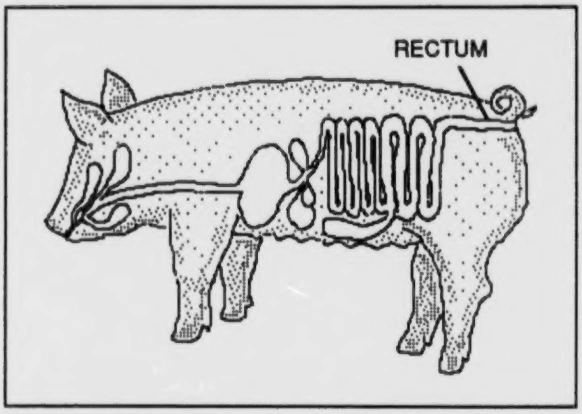
5. **Cecum**. The cecum is located at the beginning of the large intestine. Most animals don't really use their cecum. A few types of nonruminants, especially horses, use the cecum to help digest **fiber** foods such as grass and hay.



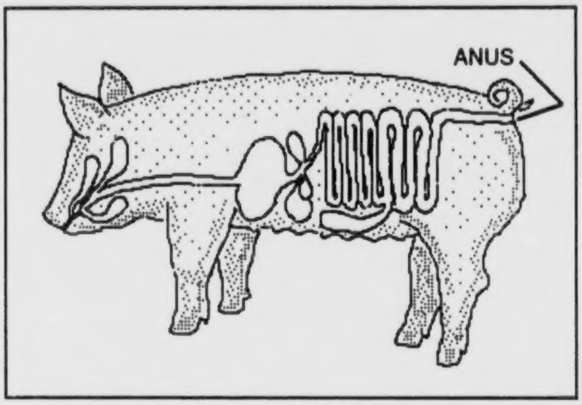
6. **Large intestine**. Bacteria in the large intestine help finish **digestion**. Also, the large intestine **absorbs** water from the material passing through.



7. **Rectum**. At the end of the large intestine is the rectum. The large intestine pushes the unusable food out into the rectum.



8. **Anus**. Undigested food remains (feces) are finally pushed out of the body through the anus.



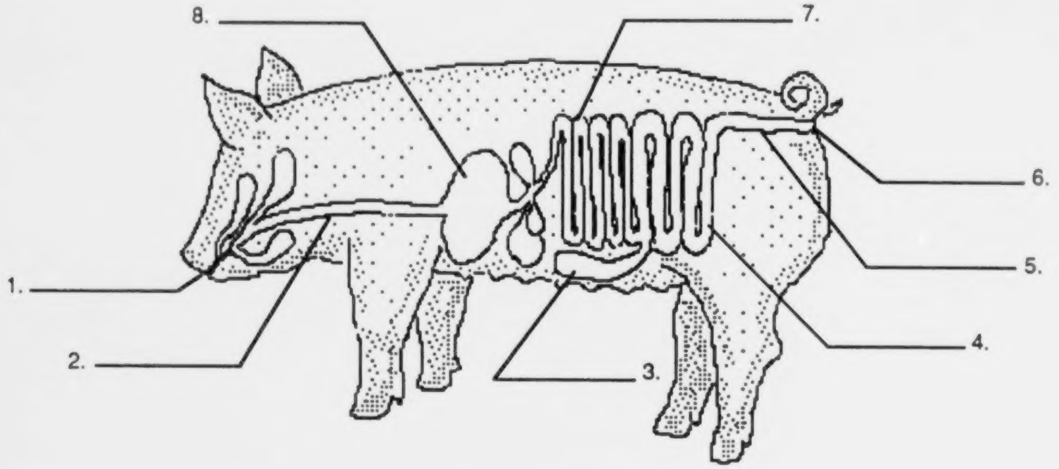
**DO SKILL SHEET 2**

DIGESTION

## SKILL SHEET 2

Part 1. Look at the illustration of a pig's digestive system. See if you can label the main parts. You will use the words below.

| | | | | | |
|---|---|---|---|---|---|
| A. | stomach | D. | anus | G. | small intestine |
| B. | mouth | E. | esophagus | H. | cecum |
| C. | rectum | F. | large intestine | | |



1.
2.
3.
4.
5.
6.
7.
8.

Now, see if you can match these same words with the statements below about what happens to food in each digestive organ.

__________ 9. Unused food is pushed out of the body here.

__________10. Food passes from the mouth to the stomach through this organ.

__________11. Food is chewed and mixed with saliva here.

__________12. Food is flooded with digestive juices high in acids and filled with enzymes. A small first part of the food begins to be absorbed into the blood from here.

__________13. Unused food is pushed from the large intestine toward the anus through this tube.

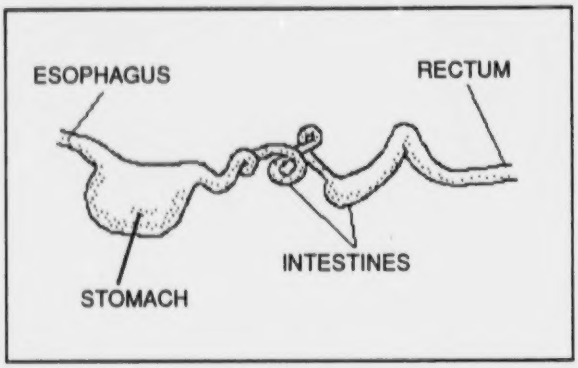
__________14. In this area digestive juices are added by the liver, gallbladder, pancreas and other organs. Most of the nutrient absorption takes place here.

__________15. This organ isn't important to the digestion of most animals. Some animals, however, use it to help digest fiber-filled food such as grass and hay.

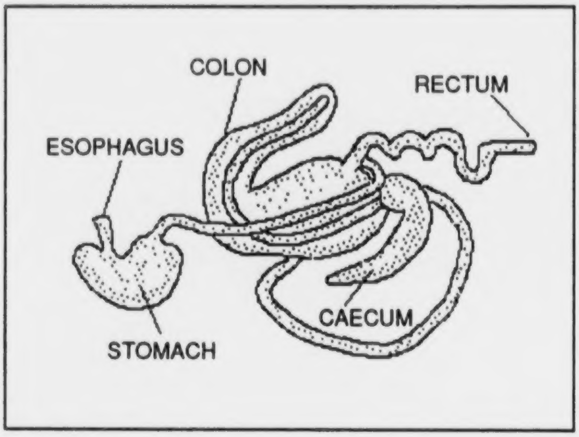
__________16. This is the last organ to take nutrients from food before it pushes the waste on out through the rectum and anus.

## D. WHICH COMMON FARM ANIMALS ARE NONRUMINANTS?

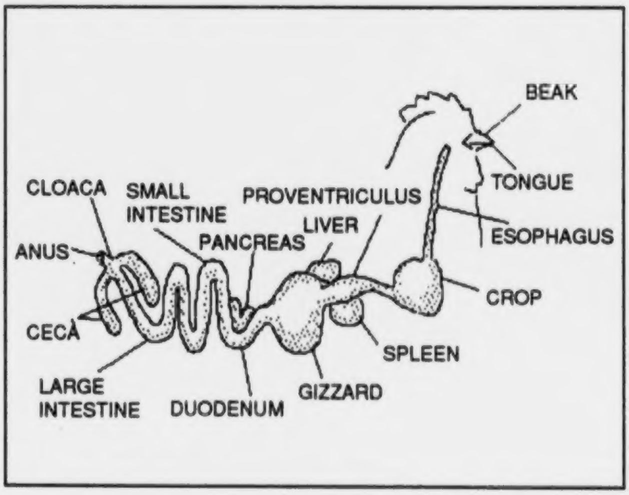
1. Pigs are nonruminants. They have one simple stomach. Their digestive system is called "**monogastric**."


ESOPHAGUS
RECTUM
INTESTINES
STOMACH

2. Horses and rabbits are special kinds of nonruminants because they eat hay and grass, but they do not chew a cud. The cecum helps them digest high-**fiber** foods (called **roughage**) such as hay and grass.


COLON
RECTUM
ESOPHAGUS
CAECUM
STOMACH

3. Poultry are nonruminants, but their digestive tract is different from the others. They have a crop and gizzard instead of teeth. Sometimes


BEAK
TONGUE
CLOACA
SMALL INTESTINE
PROVENTRICULUS
LIVER
ESOPHAGUS
ANUS
PANCREAS
CROP
CECA
SPLEEN
LARGE INTESTINE
DUODENUM
GIZZARD

we feed poultry grit (such as crushed granite or oyster shells) to help the gizzard break down the food.

Poultry have two cecum (pouches) and an enlarged part of the large intestine called the cloaca. They pass feces through the vent.

DIGESTION

## SKILL SHEET 3

Part 1. List four kinds of animals that are nonruminants

1. 2.

3. 4.

Part 2. The digestive systems of these nonruminants are slightly different. Match the animal names with the description of their digestive systems.

A. Pigs B. Horses and Rabbits C. Poultry

___ 5. They have a crop and gizzard instead of teeth. They have two ceca in the small intestine and an enlarged part of the large intestine (cloaca). Feces is eliminated through the (vent).

___ 6. They have monogastric (one simple stomach) digestive systems, and don't eat much roughage such as hay.

___ 7. They eat hay and grass, but they do not chew a cud. The cecum helps digest the roughage.

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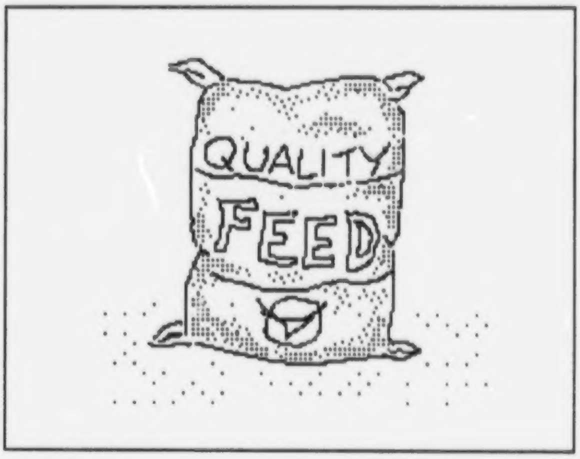
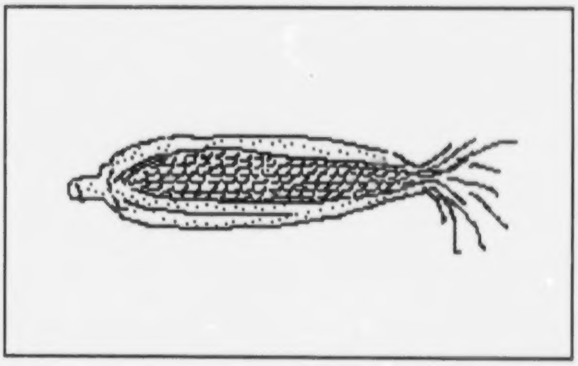
## E. WHAT FOODS DO NONRUMINANTS USUALLY EAT?

All animals need certain nutrients such as carbohydrates, fats, proteins, vitamins, minerals and water. Different animals, however, need different amounts of each of these nutrients.



Commercial feeds usually include carbohydrates, fats, proteins, vitamins and minerals. The feed tag gives the percent of each nutrient.



Nonruminants (pigs, horses, rabbits, and poultry, etc.) usually eat mostly grains such as corn, wheat, oats, barley, rye and sorghum.

Nonruminants cannot digest large amounts of **roughage** such as grass and hay.

**DO SKILL SHEET 4**

## DIGESTION

# SKILL SHEET 4

Part 1. List six nutrients all animals need.

1.
2.
3.
4.
5.
6.

Part 2. Fill in the blanks.

7. Nonruminants usually eat mostly ____________________.

8. Common grains fed to nonruminants include:

____________________

____________________

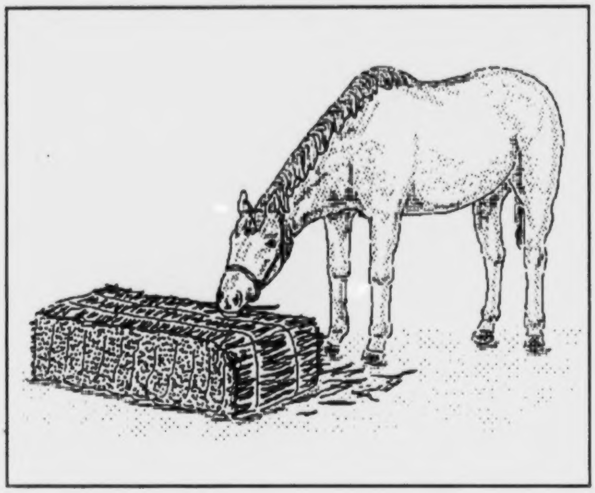
____________________

____________________

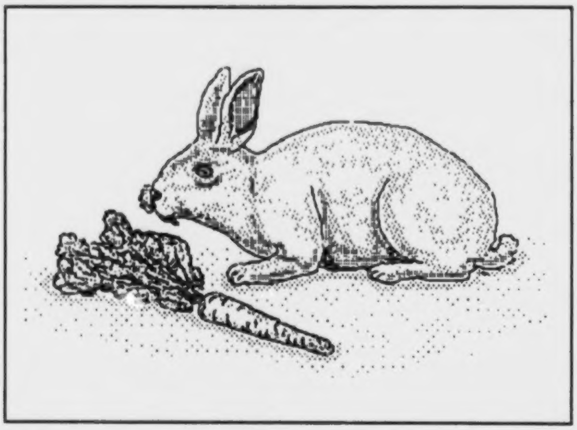
____________________

____________________

## F. WHY CAN SOME NONRUMINANTS USE LARGE AMOUNTS OF ROUGHAGE?



Horses and rabbits are nonruminants. That means they have only a simple stomach. However, they are able to eat and digest **roughage** such as grass or hay. They can digest these foods because of the bacteria in the cecum.



Rabbits are able to use **roughage** such as lettuce, grass and carrot tops. They also eat their light green pellets of feces. This allows bacteria to help with digestion in the lower digestive tract.

**DO SKILL SHEET 5**

## DIGESTION

## SKILL SHEET 5

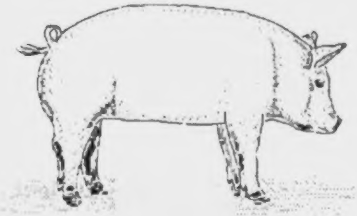
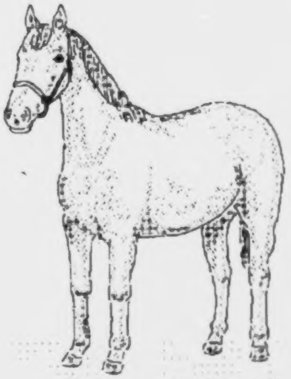
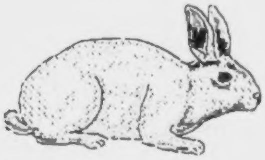
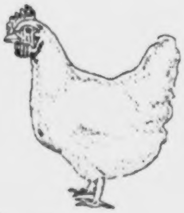
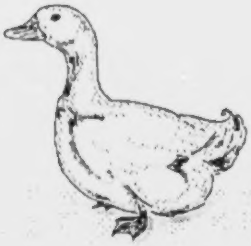
Fill in the blanks

roughage　　feces　　digestion　　cecum

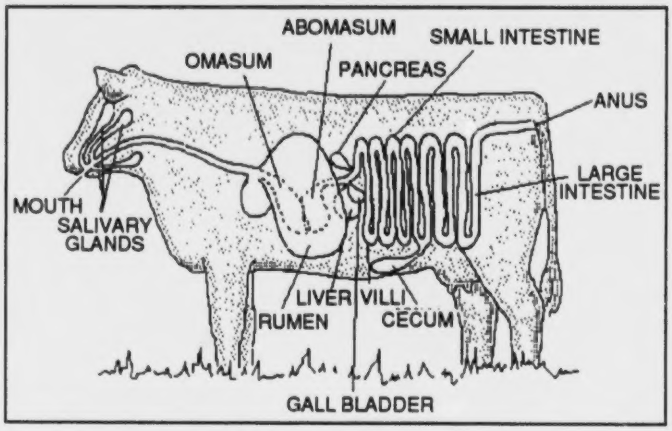
1. Some animals such as horses and rabbits digest__________(hay and grass) in the____________________.

2. Rabbits eat their light green pellets of______________. This allows the bacteria to help with________________in lower digestive tract.

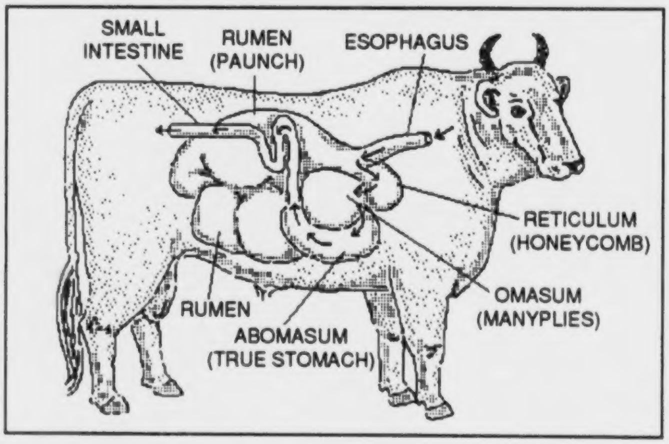
3. Put an X on the nonruminants that can eat large amounts of fibrous food.

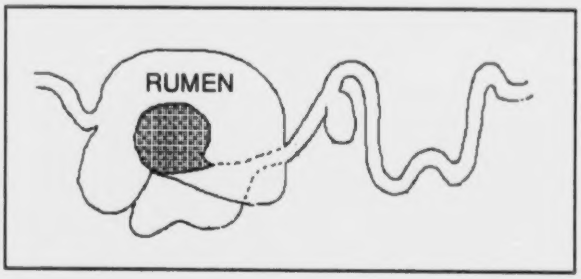
## G. WHAT ARE THE PARTS OF THE RUMINANT DIGESTIVE SYSTEM?


ABOMASUM
SMALL INTESTINE
OMASUM
PANCREAS
ANUS
LARGE INTESTINE
MOUTH
SALIVARY GLANDS
LIVER
VILLI
RUMEN
CECUM
GALL BLADDER

Many parts of the digestive system are the same for ruminants and nonruminants.


SMALL INTESTINE
RUMEN (PAUNCH)
ESOPHAGUS
RETICULUM (HONEYCOMB)
OMASUM (MANYPLIES)
RUMEN
ABOMASUM (TRUE STOMACH)

The main difference between ruminants and nonruminants is their stomachs. Ruminants, such as cows, have a four-part stomach. This four-part stomach allows cows and other ruminants to use large amounts of **roughage** such as hay or grass.



1. **Rumen**. The first part of the four-part stomach is called the rumen, or paunch.

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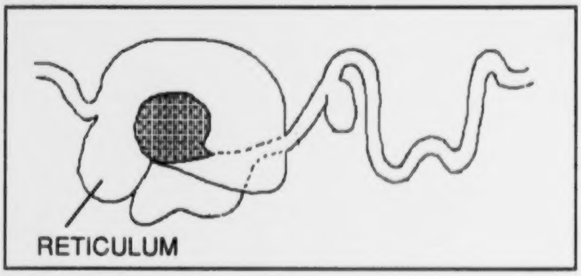
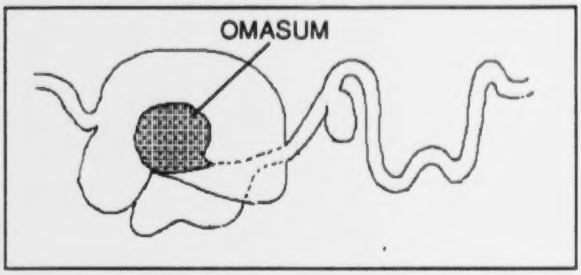
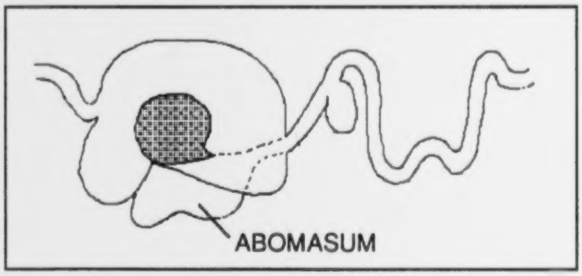
2. **Reticulum**. The next section if the reticulum, also called the "honey comb."



3. **Omasum**. The third division of the stomach is the Omasum, also called the "many plies."



4. **Abomasum**. The last section is the abomasum, also called the "true stomach."



**DO SKILL SHEET 6**

DIGESTION

# SKILL SHEET 6

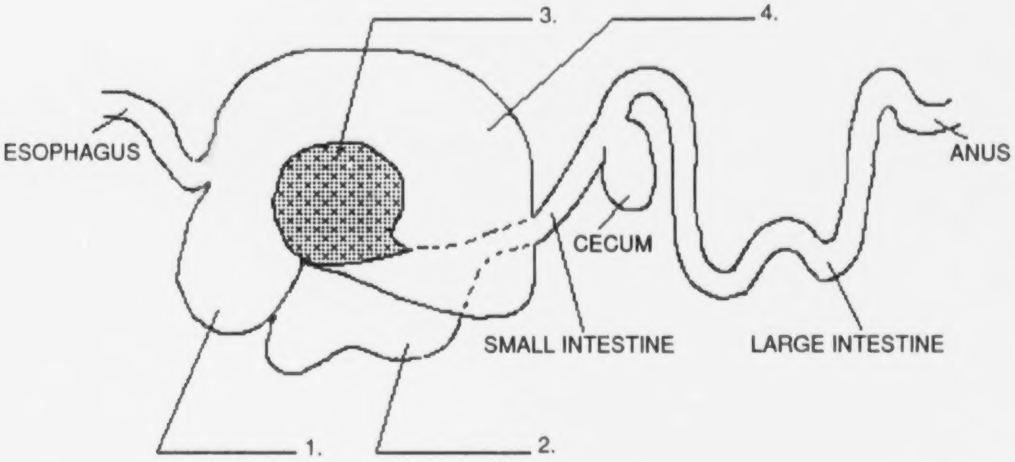
Label the parts of the ruminant stomach.

RUMEN (paunch)

RETICULUM (honey comb)

OMASUM (many plies)

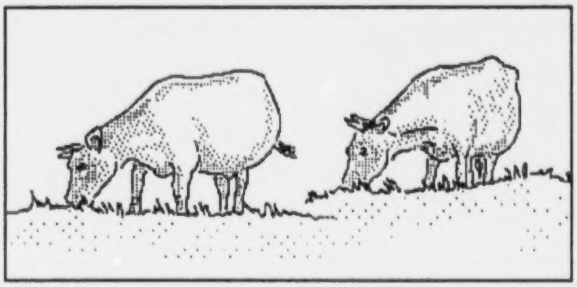
ABOMASUM (true stomach)

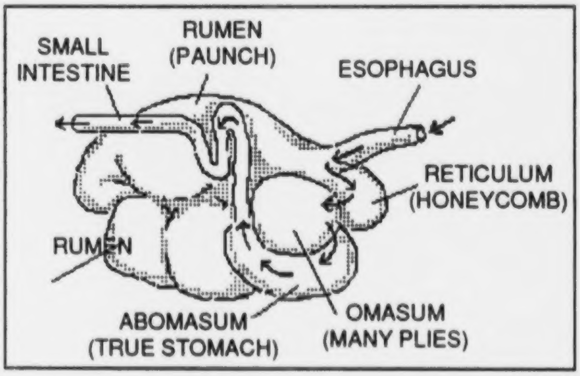

3.
4.
ESOPHAGUS
ANUS
CECUM
SMALL INTESTINE
LARGE INTESTINE
1.
2.

1.
2.
3.
4.

## H. HOW DOES THE RUMINATION PROCESS WORK?

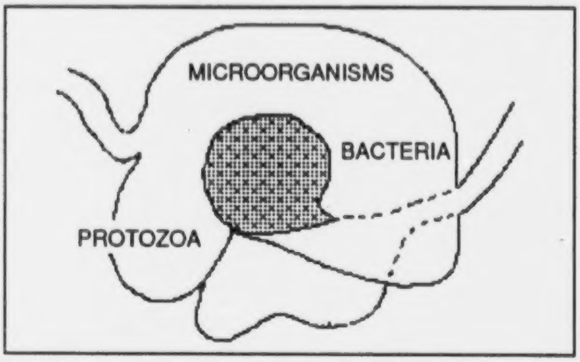
1. The ruminant animal usually eats mostly grass or hay. It doesn't chew the food completely, just long enough for saliva to mix with the food in its mouth.



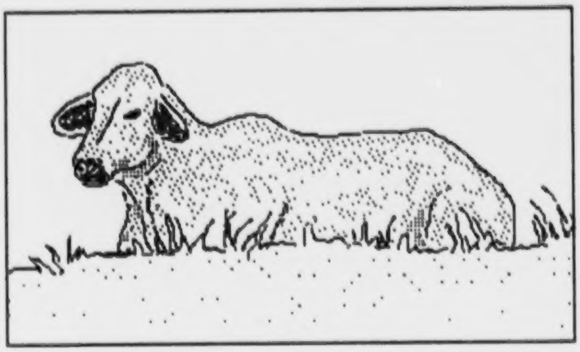

SMALL INTESTINE
RUMEN (PAUNCH)
ESOPHAGUS
RETICULUM (HONEYCOMB)
RUMEN
ABOMASUM (TRUE STOMACH)
OMASUM (MANY PLIES)

2. The food moves through the esophagus to the rumen and the reticulum.

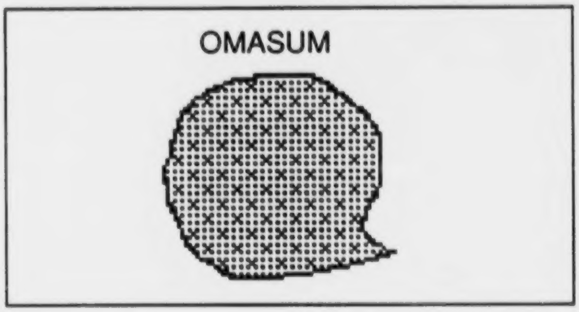
3. Bacteria, protozoa and other microorganisms help to break down the **fiber** and aid **digestion** as they produce usable nutrients. When the rumen is full, the animal lies down.


MICROORGANISMS
BACTERIA
PROTOZOA

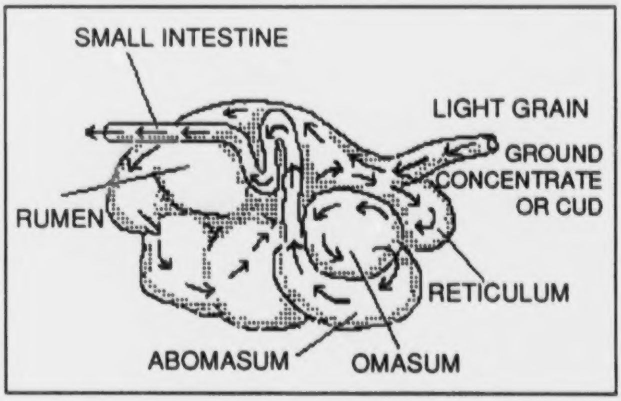
4. Food is **regurgitated** (pushed back up) into the mouth from the rumen. At this point, the animal "chews its cud." Cattle spend five to seven hours a day chewing the cud.



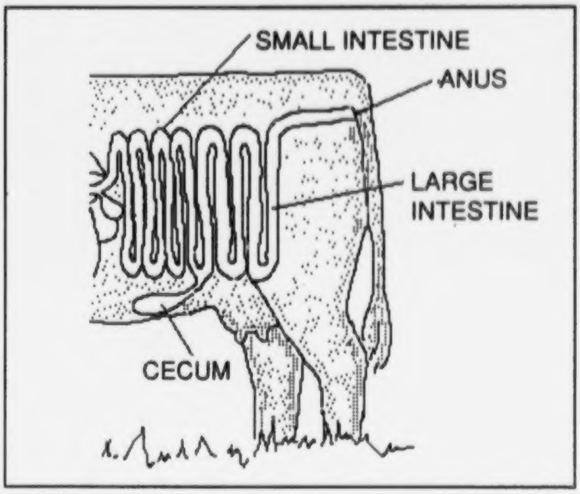
5. After the animal swallows the food a second time, it passes through the esophagus to the reticulum and then to the omasum where most of the water is **absorbed**.



6. Next, the abomasum, or true stomach, finishes most of the **digestion**. The animal's body begins to **absorb** some of the food's nutrients.


SMALL INTESTINE
LIGHT GRAIN
GROUND CONCENTRATE OR CUD
RUMEN
RETICULUM
ABOMASUM
OMASUM

7. The food goes from the abomasum to the small intestine. More nutrients are **absorbed**. Undigested food continues through the cecum and large intestine and is expelled through the anus.


SMALL INTESTINE
ANUS
LARGE INTESTINE
CECUM

## DO SKILL SHEET 7

## DIGESTION

# SKILL SHEET 7

Below are the steps in the rumination process. Put the steps in order. Number each step from 1 to 9 to show where it comes in the rumination process.

___ 1. Food is regurgitated (pushed back up) into the mouth. Animal chews its cud (that ball of partially digested food).

___ 2. Food is swallowed for the second time.

___ 3. Food (grass, hay, etc.) is taken into the mouth and chewed slightly.

___ 4. Undigested food passes through the rectum and out the anus.

___ 5. Food passes through the esophagus to the rumen and reticulum.

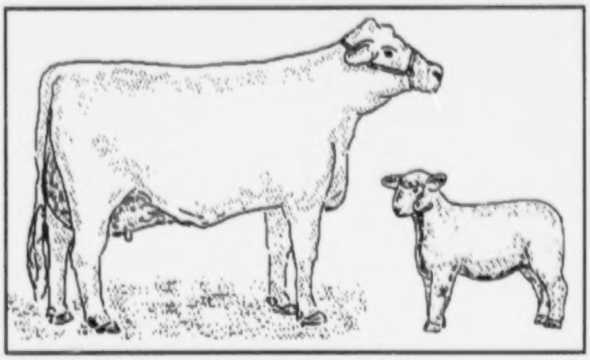
___ 6. Food goes to the omasum where most of the water is absorbed.

___ 7. Bacteria mixes with food to break it down in the rumen and reticulum.

___ 8. Food goes to the abomasum, or true stomach. The body begins to absorb nutrients.

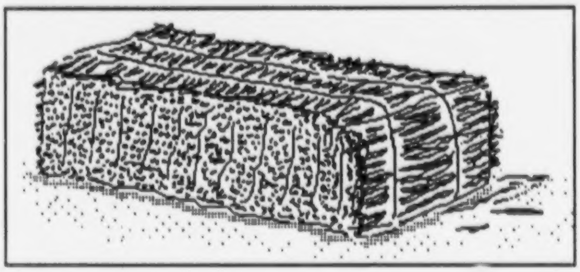
___ 9. Food goes through the small intestine, cecum, and large intestine, where digestion takes place as it does in nonruminants.

## I. WHICH COMMON FARM ANIMALS ARE RUMINANTS?

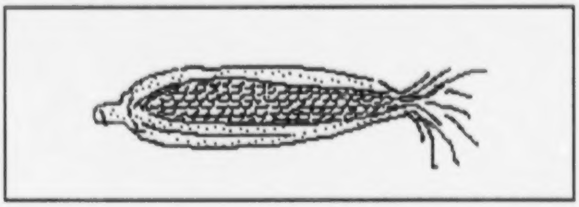


Ruminant animals chew their cuds. Cattle are ruminants. Sheep and goats are also ruminants.

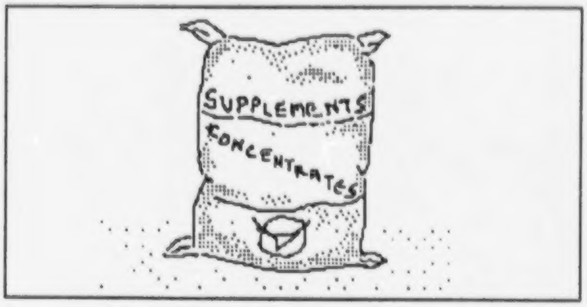
## J. WHAT FOODS DO RUMINANTS USUALLY EAT?



1. Ruminants eat hay, pasture grasses, and silage (**roughage**).



2. Ruminants also eat grains such as corn, barley, or grain sorghum heads.



3. They also need protein **supplements**. These are called **concentrates**. Protein **concentrates** contain 20 percent or more protein.

## DO SKILL SHEET 8

## DIGESTION

# SKILL SHEET 8

1. What do ruminants do that other animals do not do?

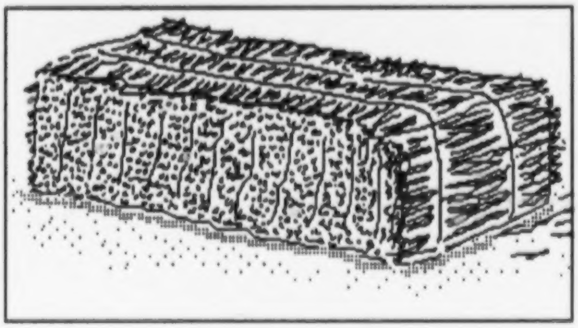
2. List three kinds of farm animals that are ruminants.

3. Write down three types of roughage that ruminants eat?

4. What are three types of grains that ruminants eat?

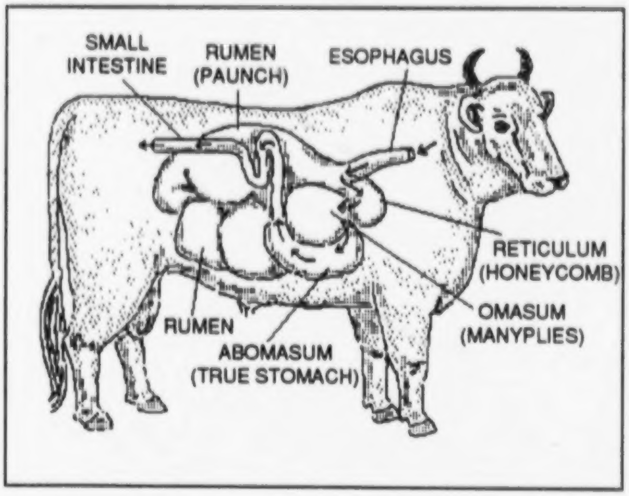
5. What do ruminants need in addition to roughage and grain?

## K. HOW DO ANIMALS' DIGESTIVE SYSTEMS AFFECT FEEDING?



1. Ruminants can eat large quantities of roughage.

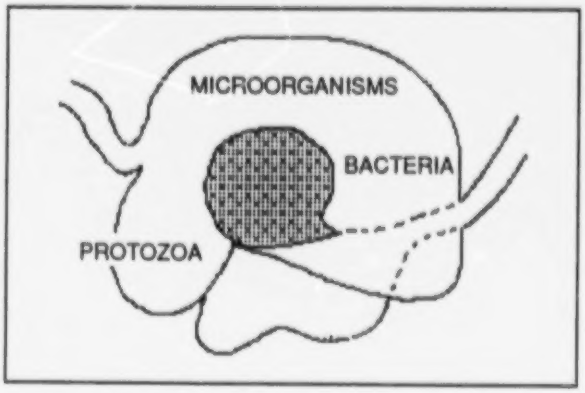
2. Ruminants do not chew their food much when they graze or eat grain. They eat and swallow rapidly.


SMALL INTESTINE
RUMEN (PAUNCH)
ESOPHAGUS
RETICULUM (HONEYCOMB)
OMASUM (MANYPLIES)
RUMEN
ABOMASUM (TRUE STOMACH)

3. The stomach of a ruminant can hold more than a nonruminant's. Large cattle can hold 40 to 60 gallons.

4. A horse's stomach can hold 3 to 4 gallons. The stomach of a pig can hold 1 1/2 to 2 gallons.

5. Bacteria in the stomach of ruminants produce some necessary nutrients. Because ruminants produce some of their own nutrients, it is quite easy to choose the kinds of foods to feed ruminants.


MICROORGANISMS
BACTERIA
PROTOZOA

**DO SKILL SHEET 9**

## DIGESTION

# SKILL SHEET 9

Directions: Choose the correct words and fill in the blanks

40 - 60
1 1/2 - 2
roughage
bacteria
nutrients
chew

1. Ruminants can eat large quantities of ______________.

2. Ruminants do not __________ much of their food. They eat rapidly.

3. The stomach of a ruminant can hold more than a _______________ stomach. Large cattle can hold_________gallons in their stomachs. Sheep can hold up to eight gallons.

4. A horse's stomach can hold ___________ gallons. The stomach of a pig can hold ________________ gallons.

5. _____________ in the stomach of ruminants produce some _________________ and that makes it easier to choose the kinds of foods to feed these animals.

## DIGESTION

# UNIT TEST

Part 1.

1. Describe how ruminants and non-ruminants are different.

2. List three farm animals that are in the ruminant group.

3. Write the kinds of feed that ruminants eat.

4. List the different parts of the ruminant stomach.

   A.

   B.

   C.

   D.

Part 2. Mark the following statements with a T for true or an F for false.

___ 5. The rumination process starts with the mouth and saliva.

___ 6. The food travels through the esophagus into the reticulum and rumen where some bacterial digestion starts.

___ 7. The food is stored in the small intestines for later regurgitation.

___ 8. A ruminant animal chews its cud and then regurgitates a second time.

___ 9. When the food is swallowed the second time, it goes through the esophagus and reticulum into the omasum where most of the water is removed.

___10. Food moves to the abomasum where digestive juices help with most of the digestion.

___11. Absorption of nutrients in the body happens mostly in the small intestine.

___12. Undigested materials move through the cecum and large intestine.

___13. The cud is another name for the abomasum.

___14. Feces is excreted through the anus.

___15. The many plies is another name for manure.

Part 3.

16. List four animals that are nonruminants.

A.

B.

C.

D.

17. What kind of feed do nonruminants typically eat?

18. What part of the digestive system makes it possible for some nonruminants to digest large quantities of roughage?

19. Which two nonruminants are able to use large quantities of roughage?

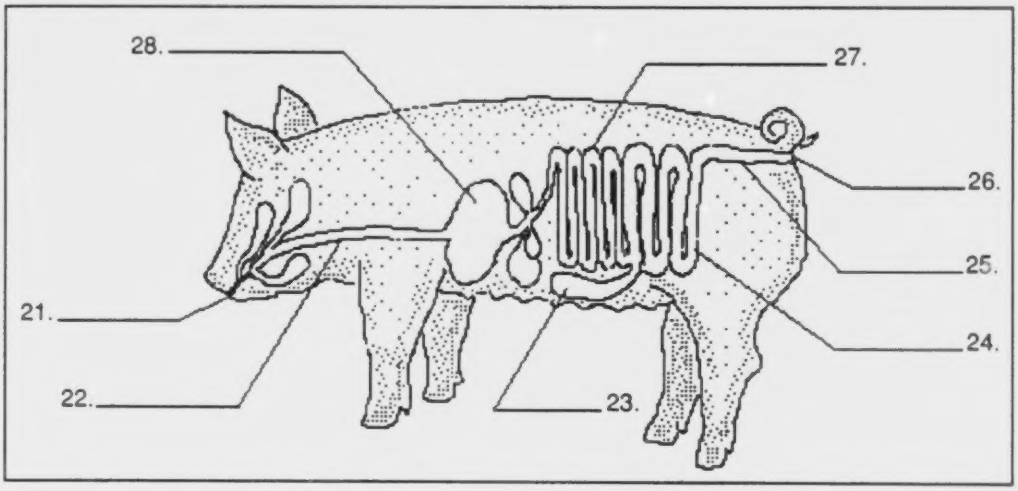
A.

B.

20. How do the different digestive systems affect feeding habits.

Part 4. Using these words, label the parts of the pig's digestive system.

| | | | |
|---|---|---|---|
| A. | stomach | E. | esophagus |
| B. | mouth | F. | large intestine |
| C. | rectum | G. | small intestine |
| D. | anus | H. | cecum |



21.
22.
23.
24.

25.
26.
27.
28.

DIGESTION

# PERFORMANCE CHECKLIST

Student__________________________ successfully performed the following tasks:

| TASK | YES | NO | COMMENTS |
|---|---|---|---|
| 1. Described the difference between ruminants and nonruminants. | | | |
| 2. Identified the parts of the nonruminant digestive system. | | | |
| 3. Listed common nonruminant farm animals. | | | |
| 4. Listed foods nonruminants typically eat. | | | |
| 5. Explained why some nonruminants can use large quantities of roughage. | | | |
| 6. Told which nonruminants use large quantities of roughage. | | | |
| 7. Listed the different parts of the ruminant digestive system. | | | |
| 8. Described the rumination process. | | | |
| 9. Listed common ruminant farm animals. | | | |
| 10. Listed foods ruminants typically eat. | | | |
| 11. Indicated how the digestive system affects feeding habits. | | | |

Satisfactory - should move on ☐

Should repeat this lesson ☐

Student's Signature/Date

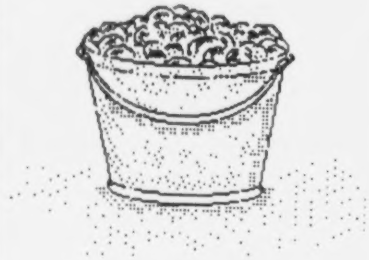
Instructor's Signature/Date

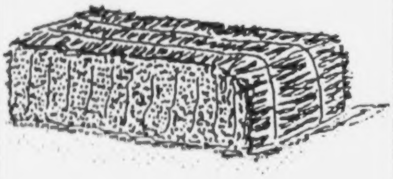
90-1400-S

# Agricultural Science I

## SUPPLEMENTARY UNITS

## Basic Nutrients





Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

### BASIC NUTRIENTS

## INTRODUCTION

Animals need basic nutrients in order to grow and to stay healthy. A person responsible for feeding animals needs to have a good knowledge of the kinds of nutrients required and the sources where the nutrients are found.

## OBJECTIVES

After you complete this unit, you will be able to list the six basic nutrients animals need, give a food source for each nutrient and explain a balanced feeding ration.

## STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. What six basic nutrients do all animals need?
2. Why do animals need these nutrients to grow and be healthy?
3. What food sources provide each of these nutrients?

4. What is the difference between a ration and a balanced ration?

5. What are some examples of balanced rations?

6. Why is a balanced ration important?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

## A. TERMS

1. **Absorption** - (ab-sorp-shun) process of taking nutrients from digested food and transferring them to the bloodstream.
2. **Fetus** - (fee-tus) an unborn baby.
3. **Gestation** - (jes-tay-shun) the period of time the fetus is in the uterus.
4. **Heat period** - (he-t peer-e-od) "in heat;" ready to breed (also called the estros cycle).
5. **Lactation** - (lak-tay-shun) the producing of milk within the animal's body.
6. **Metabolism** - (ma-tab-a-liz-um) the process of breaking down food and absorbing it into the body to provide energy.
7. **Nutrient** - (noo-tree-unt) element in food that promotes growth and development.
8. **Organic** - (or-gan-ik) coming from something that had life such as plants or animals.
9. **Inorganic** - (in-or-gan-ik) not coming from something that had life; it is not from plants or animals; inorganic matter includes rocks, etc.
10. **Amino acids** - (a-mean-o a-sids) the basic structures of proteins; the building blocks of the body.

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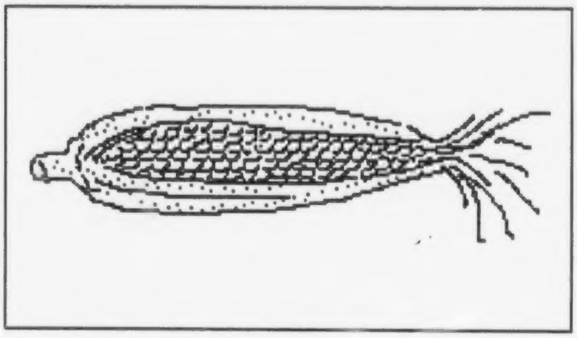
## B. WHAT SIX BASIC NUTRIENTS DO ALL ANIMALS NEED?

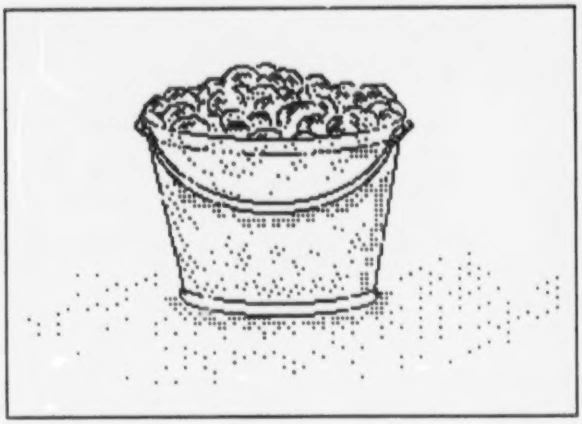
All animals need six basic **nutrients** from their food:

| | |
|---|---|
| carbohydrates | proteins |
| fats | minerals |
| vitamins | water |

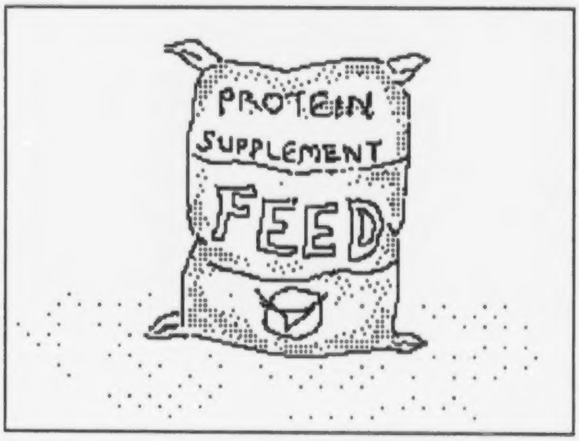
1. **Carbohydrates** - the most important source of energy. Sugars and starches are simple carbohydrates. They are used to fatten animals. Cellulose and lignin (plant fiber) are complex carbohydrates. High-fiber carbohydrates provide energy without making the animal fat.



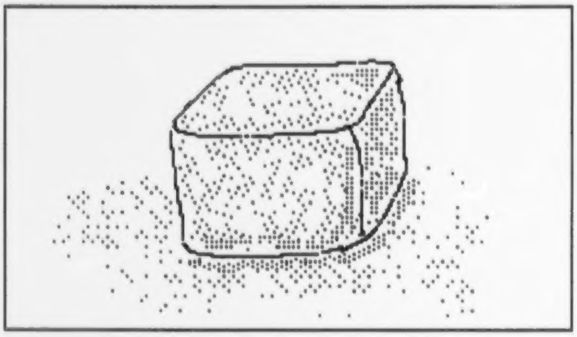
2. **Fats** - the second most important energy source. Fats improve the flavor of feed. High levels of fat in the diet cause animals to eat less and miss out on other essential **nutrients**. Fats are the oily or greasy material found in animal tissue and in the seeds of plants. Fats are a mixture of carbon, hydrogen and oxygen.



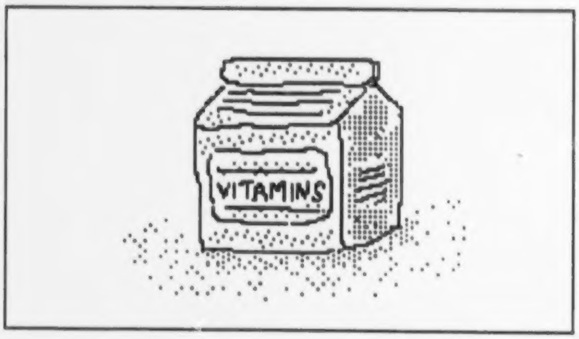
3. **Proteins** - combinations of **amino acids** that are the basic building blocks of body tissue. Protein contains carbon, hydrogen, oxygen, and nitrogen, maybe sulfur and/or iron. Protein (in different amounts and kinds) is found in all plants and animals.



4. **Minerals - inorganic nutrients.** If you were to burn a pile of corn, for example, the ash that is left contains the minerals. Minerals provide material for bones, teeth and soft tissue. Animals have to have minerals to be healthy, but they need only small amounts. There are at least 18 minerals that various animals need. Some examples are iron, calcium and magnesium.

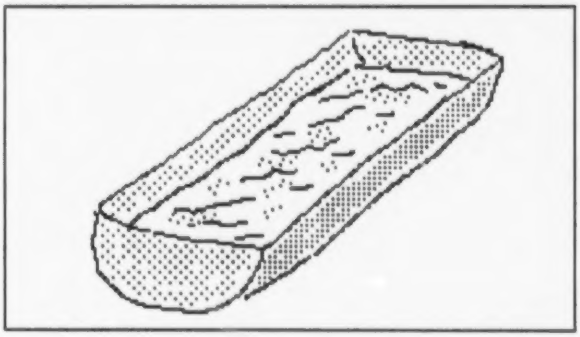


5. **Vitamins - organic nutrients**. Animals need vitamins for growth and health. They help the body use the other **nutrients**. They also help control certain body



processes. Scientists have identified 16 vitamins as necessary for animals. Like minerals, vitamins are needed only in small amounts. Examples are vitamin A and vitamin D. All vitamins contain carbon, hydrogen and oxygen.

6. **Water** - makes up most of the body weight. It is the biggest part of blood, acts as a lubricant, carries nutrients to the body and carries away waste. Water regulates body heat. It is made of hydrogen and oxygen. Animals can live longer without food than they can without water.



## DO SKILL SHEET 1

## BASIC NUTRIENTS

# SKILL SHEET 1

Part 1. List the six basic nutrients

1.
2.
3.
4.
5.
6.

Part 2. Choose the best response to complete each statement.

___ 7. An animal's most important source of energy is
- a. vitamins.
- b. minerals.
- c. carbohydrates.
- d. fats.
- e. proteins.
- f. water.

___ 8. If you want to fatten an animal, you feed it sugars and starches, which are
- a. simple carbohydrates.
- b. complex carbohydrates.

___ 9. Complex carbohydrates contain a lot of
- a. sugar.
- b. starch.
- c. vitamins.
- d. fiber.

___10. To improve the flavor of feed, you might add

a. vitamins.
b. minerals.
c. carbohydrates.
d. fats.
e. proteins.
f. water.

___11. The second most important source of energy for animals is

a. vitamins.
b. minerals.
c. carbohydrates.
d. fats.
e. proteins.
f. water.

___12. The basic building blocks of body tissue are the

a. vitamins.
b. minerals.
c. carbohydrates.
d. fats.
e. proteins.
f. water.

___13. If you burn feed, the ash left over contains

a. vitamins.
b. minerals.
c. carbohydrates.
d. fats.
e. proteins.
f. water.

___14. Iron, magnesium and calcium are

a. vitamins.
b. minerals.
c. carbohydrates.
d. fats.
e. proteins.
f. water.

___15. _____help the animal use other nutrients and control certain body functions.

a. vitamins
b. minerals
c. carbohydrates
d. fats
e. proteins
f. water

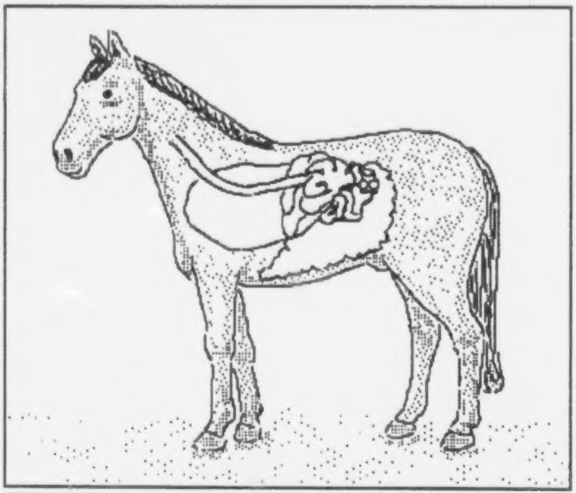
___16. ________helps control body heat and carry nutrients to all the tissues.

| | | | |
|---|---|---|---|
| a. | vitamins | d. | fats |
| b. | minerals | e. | proteins |
| c. | carbohydrates | f. | water |

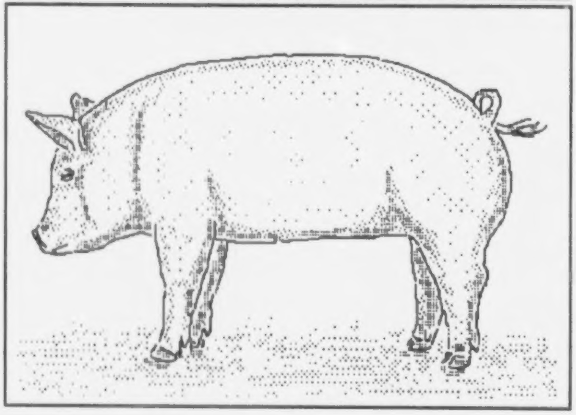
## C. WHY DO ANIMALS NEED THE BASIC NUTRIENTS FOR GROWTH AND HEALTH?

Animals must have the proper **nutrients** for their bodies to function well. These six essential **nutrients** provide material for:

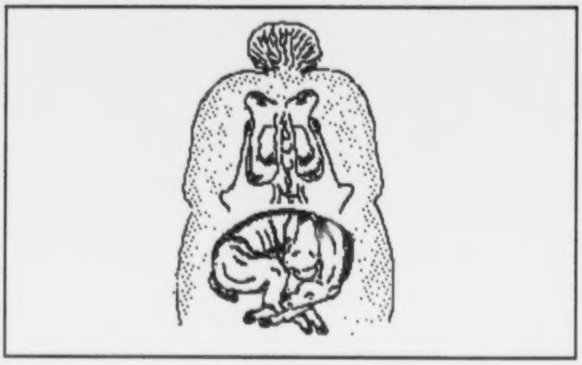
1. **Maintenance** - keeping the body warm, providing energy, repairing body organs, aiding in movement and digestion.



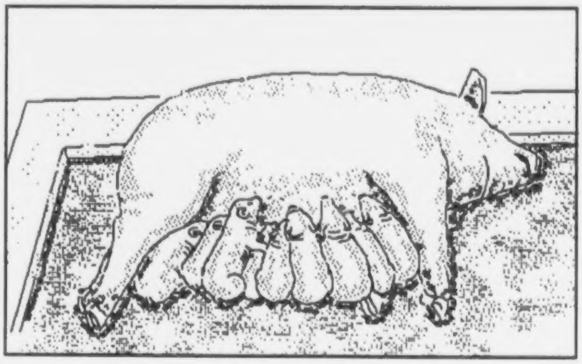
2. **Growth** - producing new cells: muscle, internal organs, bone, blood, skin, hair, wool, hooves, horns and teeth. **Nutrients** are also necessary to fatten animals for market.



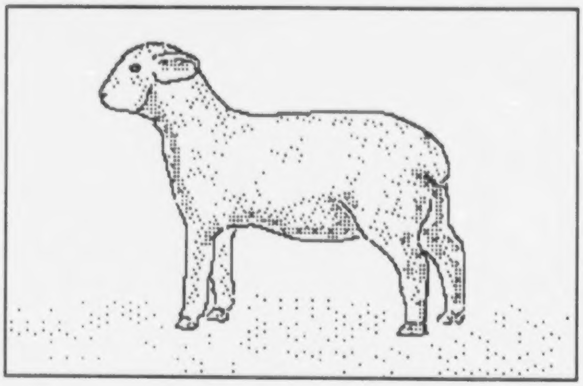
3. **Gestation** - providing **nutrition** to the mother and **fetus** for the extra growth and energy production forming a growing baby takes.



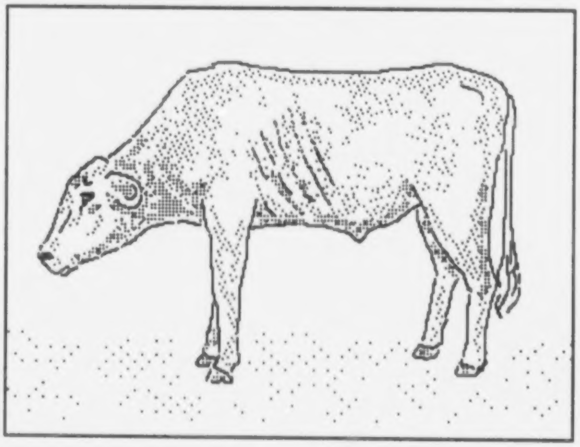
4. **Lactation** - producing milk from the mother's body for new babies.



5. **Metabolism** - breaking down food and **absorbing** it into the body to provide energy. The **nutrients** work together to help the body function.



6. **Prevention of disease** - keeping an animal from becoming sick. For example, certain kinds of anemia are caused by a lack of iron or copper in the diet.



## DO SKILL SHEET 2

## BASIC NUTRIENTS

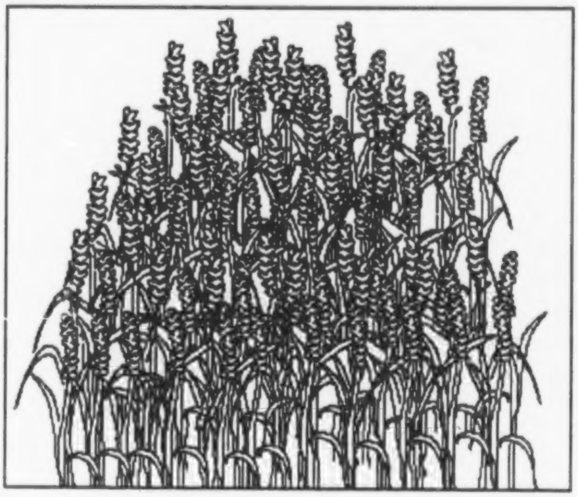
# SKILL SHEET 2

Match each bodily function on the left with its definition on the right.

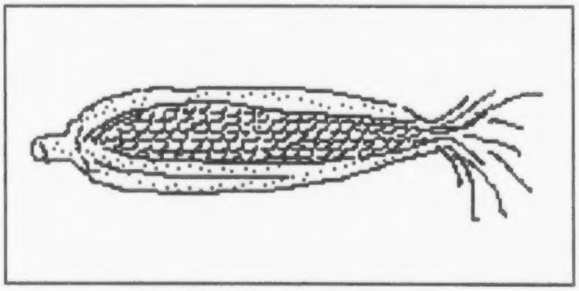
| Functions | Definitions |
|---|---|
| ___1. Maintenance | A. producing a baby |
| ___2. Growth | B. producing milk |
| ___3. Gestation | C. developing new cells of body tissue |
| ___4. Lactation | D. keeping an animal from getting sick |
| ___5. Metabolism | E. keeping the body warm and full of energy |
| ___6. Prevention of disease | F. all of the nutrients working together to provide energy |

## D. WHAT FOOD SOURCES PROVIDE FOR EACH OF THESE NUTRIENTS?

Plants and animal products, as well as minerals from the earth, provide food sources.



1. **Carbohydrates** - simple carbohydrates come from grains such as oats, wheat, corn, barley and rye. Complex carbohydrates (fiber) come from roughages such as alfalfa, brome, blue grass and orchard grass.



2. **Fats** (also oils) - come from animal fats, cereal grains and their by-products such as brewer's and distiller's dried grains, corn, gluten, and wheat middlings. Corn is high in fat.

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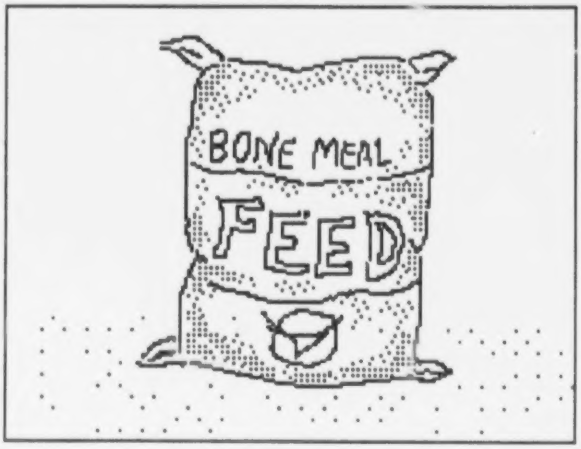
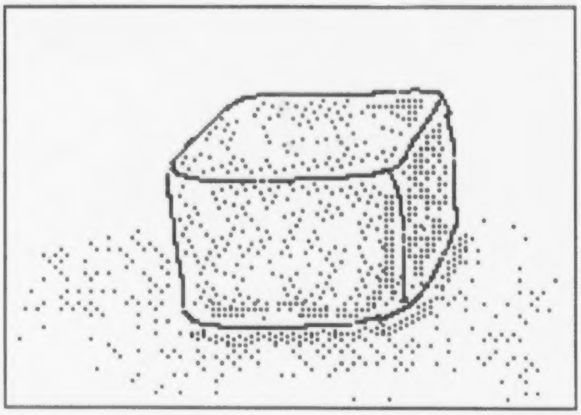
3. **Protein** - all plant and animal tissue have some protein. Good protein sources are fish meal, blood meal, meat and bone meal, dried whey, alfalfa leaf meal, cottonseed meal, soybean meal, and urea. Plant protein has less essential amino acids and, therefore, is not as good quality as animal protein.

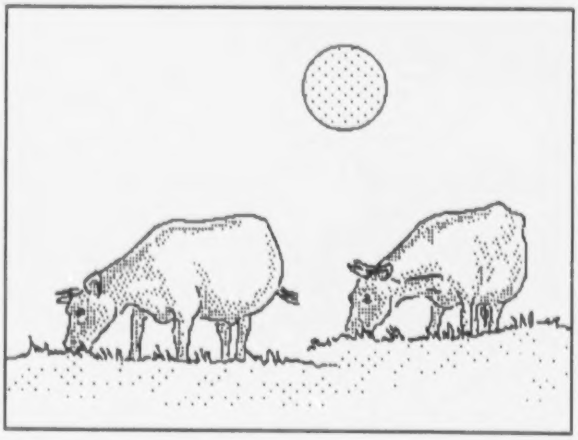


4. **Minerals** - come originally from the earth. (They then become part of plant and animal tissue). Major minerals include: salt, calcium and phosphorus. Trace minerals are: potassium, sulfur, magnesium, iron, iodine, copper, cobalt, zinc, manganese, boron,

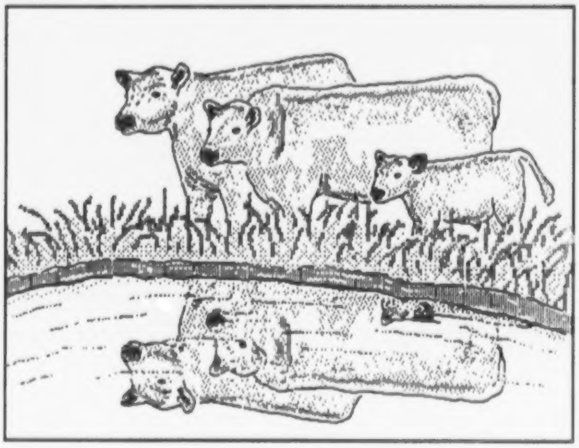


molybdenum, fluorine and selenium. Commercial feeds usually contain both major and trace minerals. Salt and mineral blocks are often put out for animals.

5. **Vitamins** - animals need vitamins A, B, C, D, E and K. Farm animals seem to get enough vitamin C and D easily (if they have a balanced diet and plenty of sunlight). Vitamins are in natural feeds and in commercial or natural vitamin supplements. Green grass provides vitamin A. Vitamin D is in sunshine and sun-cured hay. The B-complex vitamins are found in cereal grains and green pastures.



6. **Water** - found in ponds, streams and underground. Water is necessary for transporting foods in the body and regulating heat. Animals can live longer without food than without water.



**DO SKILL SHEET 3**

BASIC NUTRIENTS

## SKILL SHEET 3

Choose the best response to complete each statement.

___ 1. Simple carbohydrates are found in

a. water.
b. grains like oats and wheat.
c. salt blocks.
d. roughage like alfalfa.

___ 2. Complex carbohydrates come from

a. water.
b. sugar.
c. grains like oats and wheat.
d. salt blocks.
e. roughage like orchard grass.

___ 3. Fats and oils are abundantly available in

a. roughage.
c. water.
c. hay.
d. dried grains and wheat middlings.

___ 4. _______ is high in fat.

a. alfalfa
b. corn
c. oats
d. salt

___ 5. Meat byproducts such as bone meal are especially high in

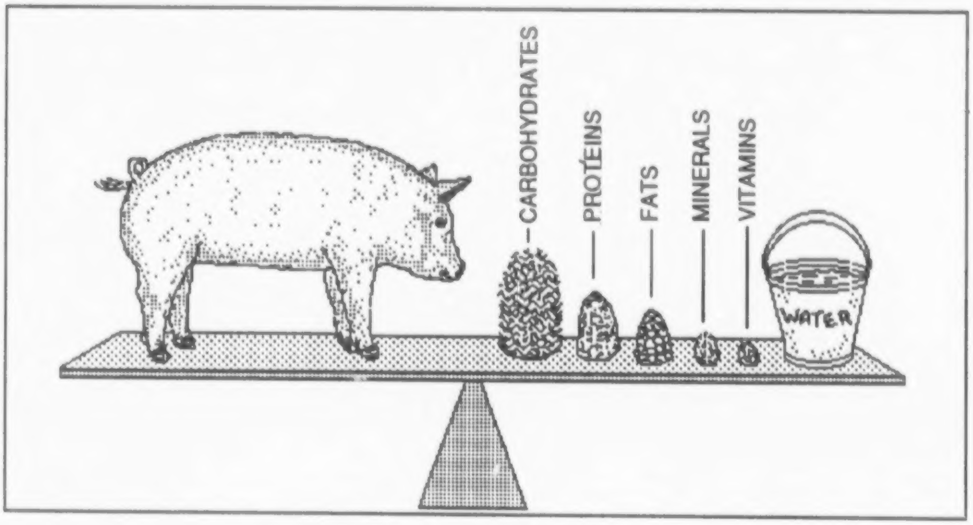
a. salt.
b. minerals.
c. vitamins.
d. water.
e. proteins.

## E. WHAT IS THE DIFFERENCE BETWEEN A RATION AND A BALANCED RATION?

1. Ration - the total amount of food provided for an animal for one day. It may or may not completely meet the **nutritional** requirements of the animal.

2. Balanced ration - contains all the six essential **nutrients** in the proper amounts for a particular animal for one day.

3. When you supply **all** of the **nutrient** needs of the animal, the ration is balanced.


CARBOHYDRATES
PROTEINS
FATS
MINERALS
VITAMINS
WATER

## F. WHAT ARE SOME EXAMPLES OF BALANCED RATIONS?

### 1. RABBITS

A suggested ration is 40% rolled oats, 25% wheat bran, 15% barley, 18% oil meal, 1% bone meal and 1% salt. This ration should make up about 60% of the rabbit's daily food. Hay or green feed should make up the other 40%.

Feeding Amounts for Various Rabbits

| Rabbit Type | Feeding Regime |
|---|---|
| Young bunnies (birth to 3 weeks) | Doe's milk only |
| Bunnies after 3 weeks | Whole grain (oats) free choice. Some hay. |
| Weaned bunnies | Free-choice concentrates and hay ration. |
| Dry does, bucks | Full feed of hay plus 3 to 6 oz. concentrate per day if needed. Adjust to maintain proper weight. Do not let does become too fat. |
| Does in heat | 2 to 4 oz. concentrate first day. Gradually increase 1/2 to 1 ounce per day to free choice in 5 to 7 days (4 to 7 oz. per day). Let the ration be 40% hay. |
| **Lactating** does | Free-choice concentrates, 40% hay. |

From the Science of Animal Husbandry, P. 658.

2. Cattle

Grower Rations for 400-pound calves

CP = Crude protein

Ration 1

6 lbs. alfalfa-grass hay, free-choice (16-18% CP)

4 lbs. grain mix (9.8% CP)

- 1500 lbs. coarsely ground shelled corn
- 455 lbs. rolled or ground oats
- 20 lbs. monosodium phosphate
- 5 lbs. vitamin premix

Ration 2

5 lbs. alfalfa-grass hay, free-choice (12-16% CP)

5 lbs. grain mix (12% CP)

- 900 lbs. rolled barley
- 1000 lbs. rolled oats
- 55 lbs. dry molasses
- 20 lbs. trace mineral salt
- 20 lbs. monosodium phosphate
- 5 lbs. vitamin premix

Ration 3

5 lbs. grass hay, free-choice (10-14% CP)

5 lbs. grain mix (10.9% CP)

1800 lbs. corn and cob meal

100 lbs. soybean meal

55 lbs. dry molasses

20 lbs. trace mineral salt

20 lbs. monosodium phosphate

5 lbs. vitamin premix

Ration 4

6 lbs. corn silage (8-9% CP)

3 lbs. grass hay (12-14% CP)

4 lbs. grain mix (17% CP)

1000 lbs. coarsely ground shelled corn

655 lbs. rolled or ground oats

300 lbs. soybean meal

20 lbs. trace mineral salt

5 lbs. limestone

15 lbs. dicalcium phosphate

5 lbs. vitamin premix

From the Science of Animal Husbandry, P. 247

**DO SKILL SHEET 4**

81

## BASIC NUTRIENTS

# SKILL SHEET 4

Look at the suggested balanced rations for rabbits and cattle to answer these questions.

1. What do you feed young bunnies from birth to 3 weeks?

2. Which rabbits are fed free-choice concentrate and hay ration?

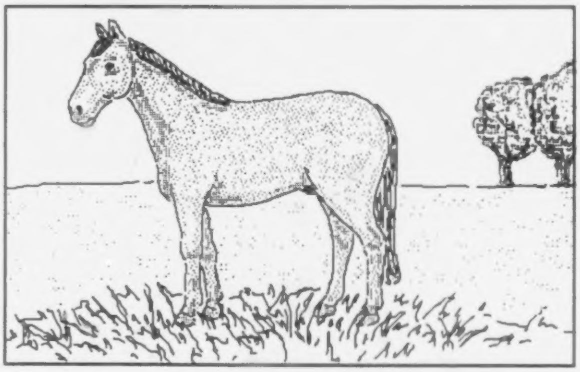
3. Lactating does should be fed what?

4. Write the number of the cattle ration that has alfalfa-grass hay with 12-16% crude protein (see pages 27, 28).

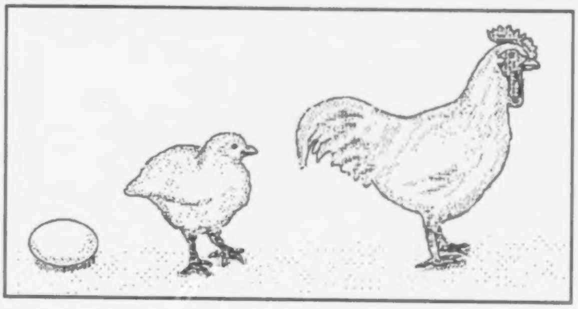
## F. WHY IS A BALANCED RATION IMPORTANT?

People feed livestock because they want to make a profit. Feed costs make up about 75% of the total cost of raising an animal. Animals do best on a balanced ration. A balanced ration will meet the animals needs for:

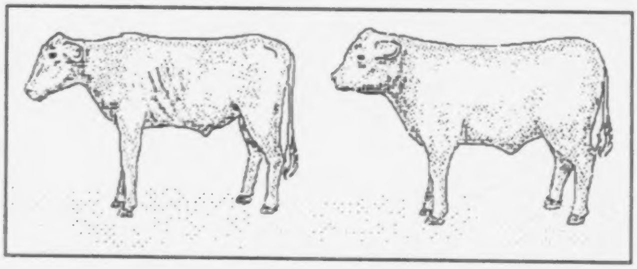
1. **Maintenance** - keeping the animal alive and functioning OK.



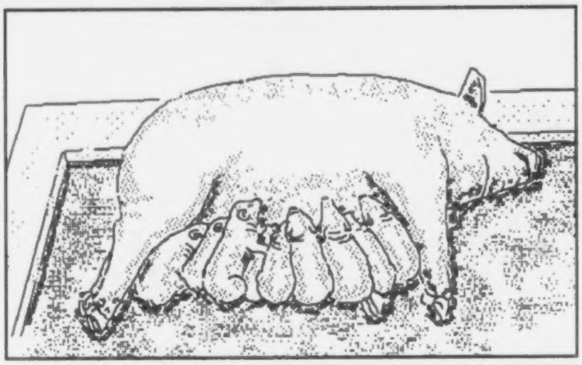
2. **Growth** - increasing the size of muscles, bones and other organs.



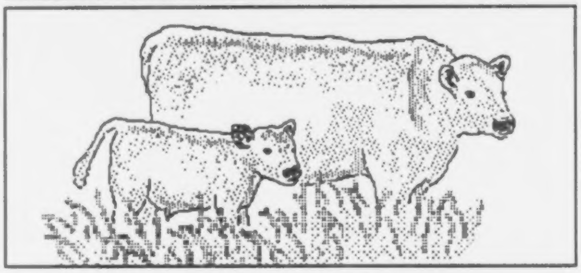
3. **Fattening** - obtaining the right amount of fat in the muscle tissues without becoming overweight.



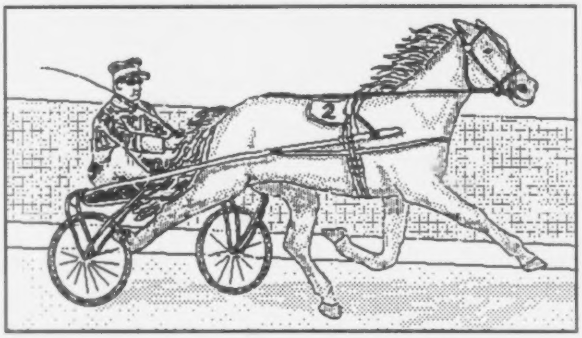
4. **Production** - producing milk to feed the young, producing eggs, producing wool, etc.



5. **Reproduction** - breeding and producing babies.

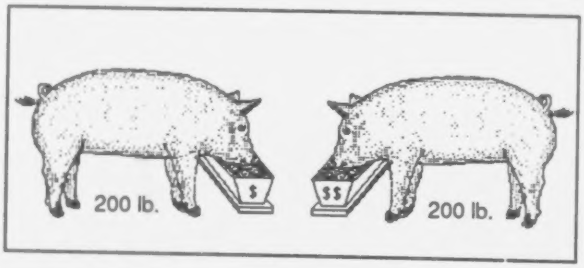


6. **Work** - pulling things, carrying people, racing, etc.

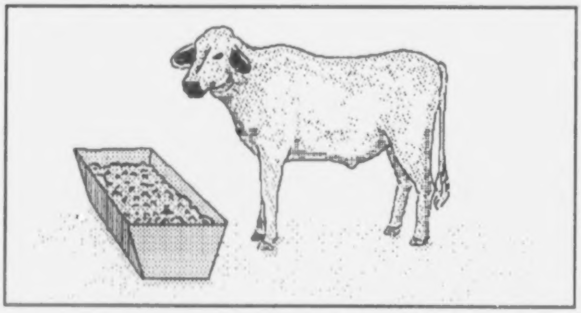


**Nutritional** content, however, is not the only thing you must consider when planning a balanced ration for your livestock. The ration you choose should also:

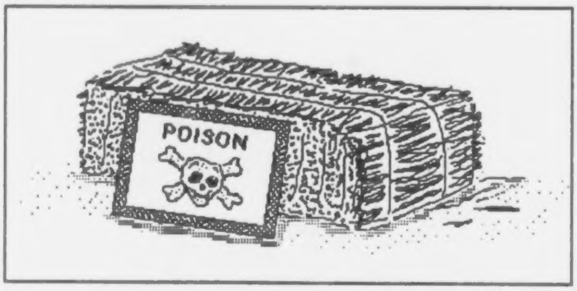
1. Be as cheap as possible while still meeting the animal's **nutritional** requirements.


200 lb.
$
$$
200 lb.

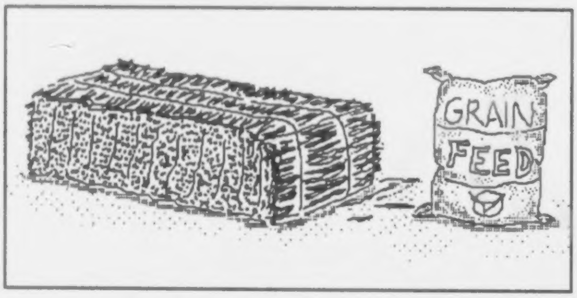
2. Taste good enough so that the animals will eat it.



3. Be free from weeds and plants that are poisonous because animals do not always avoid these harmful items.



4. Contain the right proportions of roughages and concentrates.



## DO SKILL SHEET 5

## BASIC NUTRIENTS

## SKILL SHEET 5

Part 1. List six reasons a balanced ration is important?

1.

2.

3.

4.

5.

6.

Part 2. Mark the following statements a "T" if the statement is true or an "F" if the statement is false.

___ 7. How feed tastes is not really important if it contains all the right nutrients.

___ 8. Animals won't eat poisonous plants, so you don't have to worry about that.

___ 9. Always buy the most expensive feed.

___10. You need to be sure roughage and concentrates are properly balanced in the animal's feed.

## BASIC NUTRIENTS

# UNIT TEST

Part 1. Match each nutrient below with the food source from which it comes.

A. Water
B. Fats (oils)
C. Minerals
D. Carbohydrates
E. Vitamins
F. Protein

___ 1. They come from grain such as oats, wheat, corn, barley, rye, and grain sorghum. Fiber comes from roughages such as alfalfa, brome, blue grass and orchard grass.

___ 2. All plants and animal tissue have this. Some good sources are: fish meal, blood meal or meat and bone meal, dried whey, alfalfa leaf meal, cottonseed meal, soybean meal and urea. In plants, this has less essential amino acids and, therefore, is not as good quality as that coming from animals.

___ 3. They come from animal fats, cereal grains and their by-products such as brewer's and distiller's dried grains, corn gluten and wheat middlings. Corn contains a high amount.

___ 4. These come from the earth, mined and processed. Both major and trace are usually in commercial feeds. Blocks can be put out for the animals.

___ 5. A, B, C, D, E and K are needed. Farm animals seem to have enough C and D (if they have a balanced diet and plenty of sunlight). They are in natural feeds and commercial or natural supplements. A good source of A is green grass; D is sunshine and sun-cured hay. The B-complex are found in cereal grains and green pastures.

___ 6. This is found in ponds, streams and underground. It is necessary for transporting foods in the body and regulating heat. Animals can live longer without food than without this.

Part 2. Match each bodily function on the left with its definition on the right.

| **Functions** | **Definitions** |
|---|---|
| ___7. Maintenance | A. producing a baby |
| ___8. Growth | B. producing milk |
| ___9. Gestation | C. developing new cells of body tissue |
| __10. Lactation | D. keeping an animal from getting sick |
| __11. Metabolism | E. keeping the body warm and full of energy |
| __12. Prevention of disease | F. all of the nutrients working together to provide energy |

Part 3. Choose the best response to complete each statement.

___13. Simple carbohydrates are found in

a. water.
b. grains like oats and wheat.
c. salt blocks
d. roughage like alfalfa.

___14. Complex carbohydrates come from

a. water.
b. sugar.
c. grains like oats and wheat.
d. salt blocks
e. roughage like orchard grass

___15. Fats and oils are abundantly available in

a. roughage.
c. water.
c. hay.
d. dried grains and wheat middlings.

___16. ________ is high in fat.

a. alfalfa
b. corn
c. oats
d. salt

___17. Meat byproducts such as bone meal are especially high in

a. salt
b. minerals
c. vitamins
d. water
e. proteins

___18. A major source of minerals for livestock is

a. licking blocks
b. cattle rubs
c. brush leaves
d. water
e. hay

___19. Vitamin D is naturally available in

a. sun-cured hay
b. water
c. milk
d. salt

___20. Cereal grains and green pastures are rich in

a. vitamin C
b. B-complex vitamins
c. vitamin D
d. vitamin A

___21. Water is

a. not as important as other nutrients.
b. a very important part of the animal's diet.
c. not necessary, but animals like it.
d. a good source of carbohydrates.

Part 4. Mark the following statements a "T" if the statement is true or an "F" if the statement is false.

___22. How feed tastes is not really important if it contains all the right nutrients.

___23. Animals won't eat poisonous plants, so you don't have to worry about that.

___24. Always buy the most expensive feed.

___25. You need to be sure roughage and concentrates are properly balanced in the animal's feed.

BASIC NUTRITION

# PERFORMANCE CHECKLIST

Student__________________________successfully performed the following tasks:

| TASK | YES | NO | COMMENTS |
|---|---|---|---|
| 1. Listed the six basic nutrients. | | | |
| 2. Explained why they are essential. | | | |
| 3. Selected food sources for each nutrient. | | | |
| 4. Detected the difference between a ration and a balanced ration. | | | |
| 5. Gave examples of balanced rations. | | | |
| 6. Stated reasons a balanced ration is needed. | | | |

Satisfactory - should move on ☐
Should repeat this lesson ☐

________________________
Student's Signature/Date

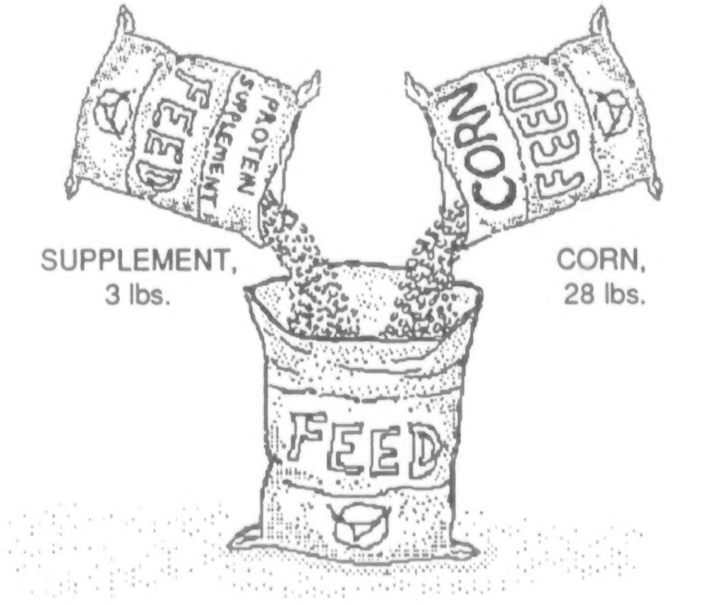
________________________
Instructor's Signature/Date

90-1400-S

# Agricultural Science I

SUPPLEMENTARY UNITS

## Balanced Rations


PROTEIN SUPPLEMENT
FEED
CORN
FEED
SUPPLEMENT,
3 lbs.
CORN,
28 lbs.
FEED

## 10

LEGUME

Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

BALANCED RATIONS

## INTRODUCTION

In order to provide the proper diet for animals, you should understand how to mix feeds that provide all the necessary nutrients. Animals need a different balance of nutrients for different purposes. Some of those purposes are: maintenance, growth, production, reproduction, work or fattening.

## OBJECTIVE

After you complete this unit, you should be able to balance a simple ration.

## STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. Why is protein one of the most important of the six nutrients in a balanced ration?
2. How do the protein needs of different animals vary?
3. What feeds and supplements are available?

4. How do feeds differ in nutrient content?

5. What is a Pearson Square?

6. How do you use the Pearson Square to balance rations?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

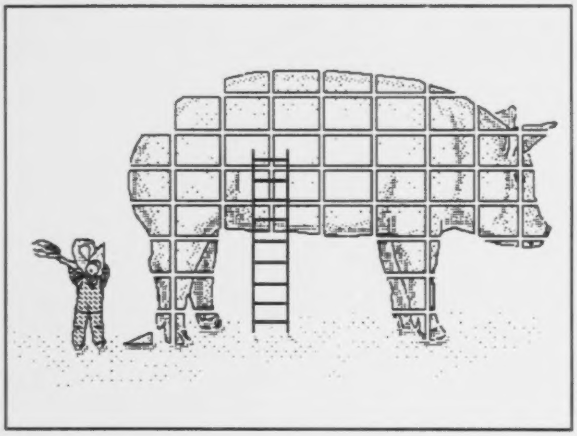
## A. TERMS

1. **Amino acids** - (a-mean-o a-sids) they combine to make various proteins.
2. **Antibiotics** - (an-ti-bi-otics) chemical substances that destroy bacteria and other microorganisms.
3. **Diagonal** - (di-ag-a-nl) catty cornered.
4. **Gestation** - (jes-tay-shun) pregnancy.
5. **Lactating** - (lak-tay-ting) making milk.
6. **Tankage** - (tank-ig) animal bones and tissue that are cooked then dried and ground.
7. **Legumes** - (leg-yooms) plants including peas, beans, clovers that can collect nitrifying bacteria on nodules on its roots. Legumes can meet much of their own nitrogen needs.

## B. WHY IS PROTEIN ONE OF THE MOST IMPORTANT OF THE SIX NUTRIENTS IN A BALANCED RATION?

Protein is the main material in muscles. Proteins are the building blocks for all body tissue. Proteins are organic nitrogen compounds.

Each protein is made up of small parts called **amino acids**. Scientists have found 25 different kinds of **amino acids**. A protein may contain as few as three or four different kinds of **amino acids** or as many as 14 or 15.



**Reasons animals need protein:**

1. To aid in the enzyme action that helps in digestion

2. To support hormones that regulate body functions

3. To help with metabolism in the cells of the body

4. To aid in development of hair, skin and other tissue

Nitrogen makes up about 16% of **amino acids**. Ammonia is a form of nitrogen.

**DO SKILL SHEET 1**

BALANCED RATIONS

## SKILL SHEET 1

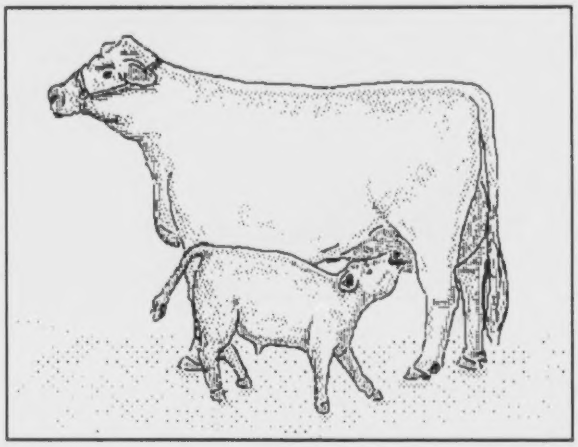
Use the following words to fill in the blanks in the statements below.

25
protein
tissue
14 or 15
nitrogen
hormones
enzyme action
body tissue
amino acids
metabolism
3 or 4

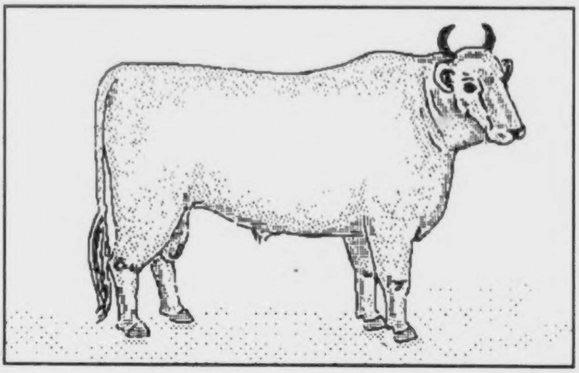
1. ____________ is the main material in muscles.
2. Protein is a fundamental part of all _______ _______.
3. Protein is made up of small units called ___________ ________.
4. Scientists have found ____________ different kinds of amino acids.
5. A protein may contain as few as ________ or ________ different kinds of amino acids or as many as ____ or ____.
6. Protein aids in the _________ _________ that helps in digestion.
7. Protein supports ______________ that regulate body functions.
8. Protein helps with _____________ in the cells of the body.
9. Protein is necessary in development of hair, skin and other _______.
10. _____________ makes up about 16% of _________ _____________. Ammonia is a form of nitrogen.

## C. HOW DO THE PROTEIN NEEDS OF DIFFERENT ANIMALS VARY?

1. Faster growing young animals, as well as those that are pregnant or making milk, need larger amounts of protein than other animals. (You remember that protein is made up of **amino acids**.) When animals are developing more tissue, it takes protein to form the "building blocks" of that tissue.



2. Older animals need less protein than the young because growth slows down.



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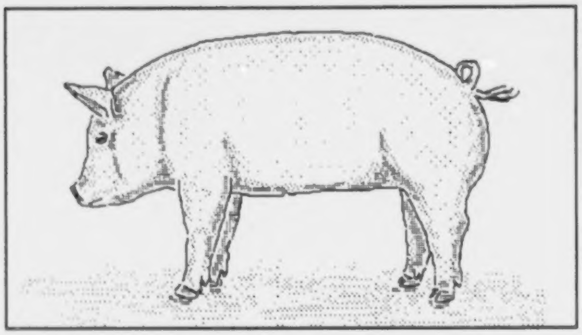
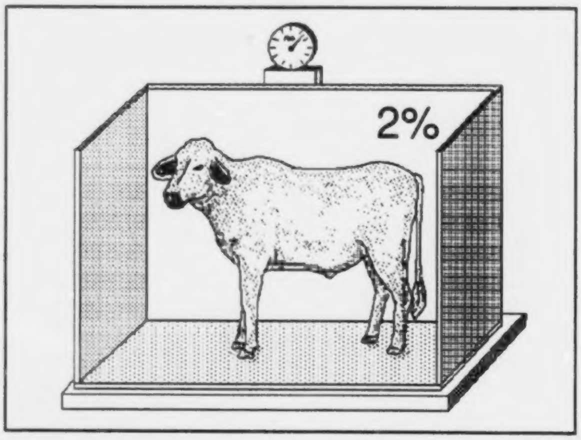
3. Nonruminants need more protein than ruminants.



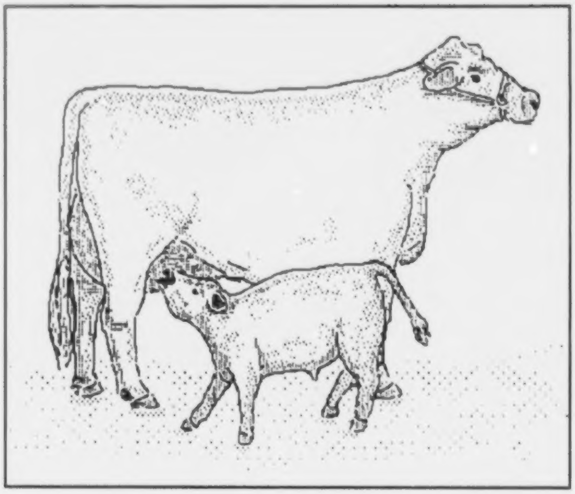
4. Nonruminants need 10 essential **amino acids.** Ruminants can use nitrogen sources and **make** these **amino acids** inside their own bodies. They do this by using bacteria in the rumen. Therefore, cattle need less feed containing **amino acids** as the rumen develops. A young calf needs more protein than a grown cow.

10

## FEEDING CATTLE

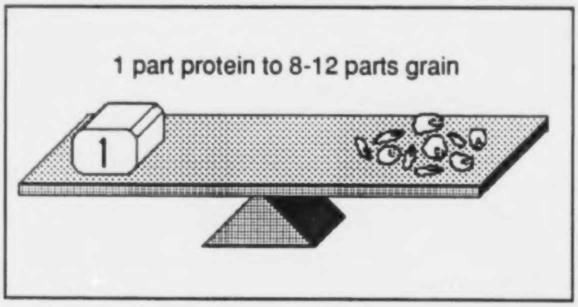


A rule of thumb for feeding cattle for maintenance is: feed each animal 2% of its body weight of air-dry roughage each day. If you are feeding 100% dry matter (from which all moisture is removed), figure about 1.8% of body weight. When you are fattening the animal, add .5% more to each figure.



You should feed cows nursing calves about one and a half times as much as you would a dry cow.

When you are fattening cattle, you should give the animal 2 - 2.5% of its body weight of air-dry grain and .5 - 1% as air-dry roughage. You should also include a protein supplement. Use one part protein supplement to 8 to 12 parts grain.


1 part protein to 8-12 parts grain
1

## FEEDING SWINE

Pigs need these amounts of protein:

| Stage of growth | Protein requirement |
|---|---|
| pre-starter | 18 to 20% |
| starter | 16% |
| grower | 14% |
| finisher | 10 to 12% |

Swine feed needs to include six of the B vitamins. Cattle produce vitamin B in their bodies.

## DO SKILL SHEET 2

BALANCED RATIONS

## SKILL SHEET 2

Choose one or more answers and write the letter(s) in the blanks below.

A. Pregnant and lactating animals
B. Faster growing young animals
C. Ruminants
D. 10 essential amino acids
E. Amino acids
F. Building blocks
G. Growth
H. .5%
I. 1.8%
J. 1 1/2 times
K. Manufacture
L. B vitamins
M. 8 to 12 parts
N. Rumen
O. 2%

___ 1. Need larger amounts of protein.

___ 2. When animals are developing more tissue, protein provides the ________ ________ for that tissue.

___ 3. Older animals need less protein because what slows down?

___ 4. Nonruminants need more protein than which animals?

___ 5. Ruminants can use nitrogen sources and make these in their own bodies by using bacteria in the rumen.

___ 6. Cattle need less feeds containing amino acids as the _______ develops?

___ 7. A rule of thumb for feeding cattle for maintenance is: feed air-dry roughage at the rate of about what percent of the body weight per day?

___ 8. If all dry matter is used for calculation of feed needed, what percent of the body weight should be fed?

___ 9. Add about what percent more feed per body weight for fattening.

___10. Cows nursing calves should be fed how much more than dry cows?

___11. When feeding grain to cattle, add one part protein supplement to how many parts grain?

___12. Swine's feed needs to include six________?

___13. Cattle do __________ with their own vitamin B?

Part 2. Draw a line to match the correct percentage of protein with the stage of pig growth.

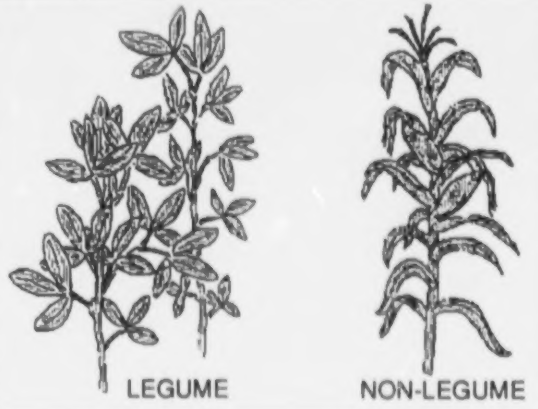
| Stage of growth | Protein requirement |
|---|---|
| pre-starter | 14% |
| starter | 16% |
| grower | 10 to 12% |
| finisher | 18 to 20% |

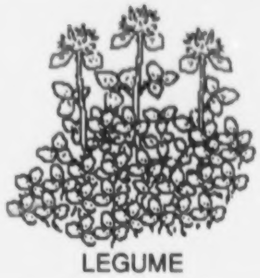
## D. WHAT FEEDS AND SUPPLEMENTS ARE AVAILABLE?

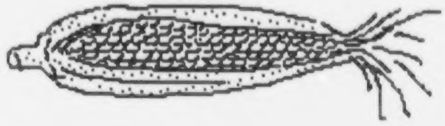
1. **Roughage** is feed containing more than 18% crude fiber when it is dry. There are two kinds of roughage: **legumes** and **nonlegumes**.

   a. **Legumes** are high in protein. Some common **legumes** are: clover, alfalfa, soybeans, trefoil, lespedeza, peas and beans.

   b. **Nonlegumes** are usually lower in protein. Examples of **nonlegumes** are: corn silage, corn stalks, sorghum silage, fodders, fescue, bluegrass, timothy, redtop, brome, orchard grass, bermuda and prairie grass.



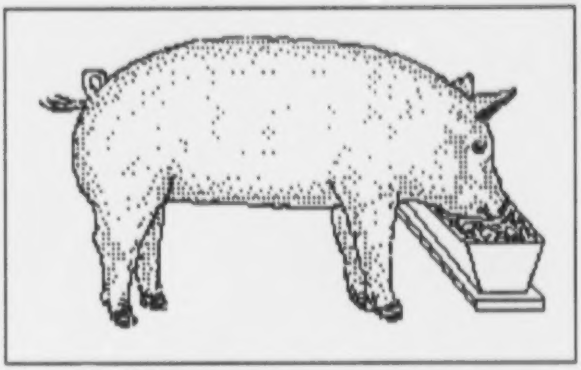


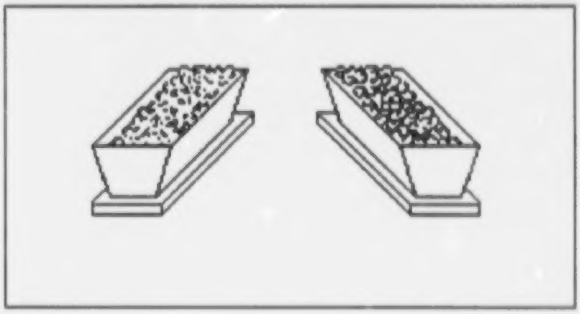


2. **Concentrates** are feeds that contain less than 18% crude fiber when dry. There are two kinds of concentrates:

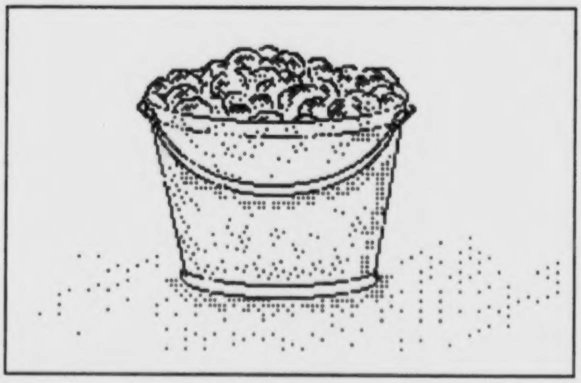
   a. Protein supplements (20% or more protein)

   b. Energy feeds (less than 20% protein)





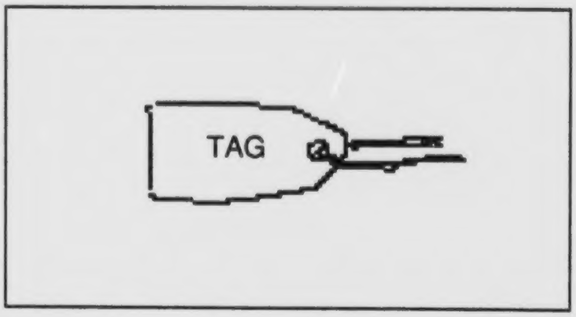
Protein supplements may be animal or vegetable products. Commercial protein supplements are mixes of animal and vegetable protein. They often have vitamins, minerals and even **antibiotics** included in the mix. (**Antibiotics** must not be fed for a certain period of time before shipping the animal to market.)



Examples of animal proteins are: **tankage**, meat scraps, meat and bonemeal, fish meal, dried skimmed milk, dried whole milk, blood meal and feather meal.

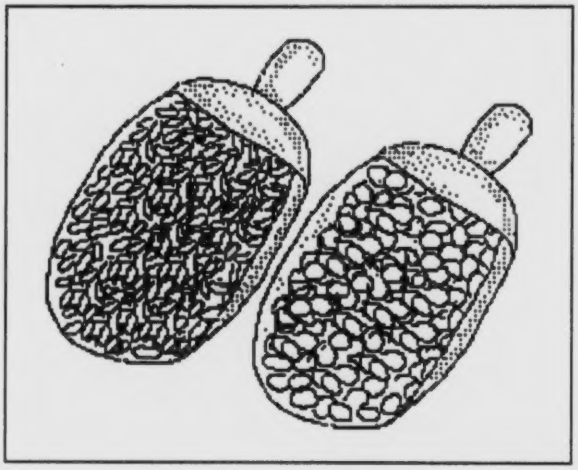
SOYBEAN MEAL
FEED

Examples of vegetable proteins are: soybean meal, cottonseed meal, linseed oil meal, peanut oil meal, corn gluten, and brewer's and distiller's dried grains.



The tag on the feed will tell what the mix contains and which kind of animals should eat it. Be sure to follow the directions on the feed tag.

Energy supplements. Most grains are energy feeds (less than 20% crude protein). Examples of energy concentrates are: corn, oats, rye, wheat, barley, sorghum grain, wheat bran, wheat middlings, dried citrus pulp and dried beet pulp.



**DO SKILL SHEET 3**

BALANCED RATIONS

## SKILL SHEET 3

Choose the best response to complete each statement or question.

___ 1. Roughage contains more than___crude fiber.

a. 5% b. 18%

c. 50% d. 73%

___ 2. There are two kinds of roughage. They are ____and ___.

a. hay & wheat b. beans & corn

c. legumes & nonlegumes c. legumes & hay

___ 3. Legumes are high in ____.

a. fat b. minerals

c. sugar d. protein

___ 4. ____ and ____ are legumes.

a. clover & alfalfa b. clover & bluegrass

c. alfalfa & orchard grass d. bluegrass & orchard grass

___ 5. Nonlegumes are usually ______ in protein than legumes.

a. higher b. lower

c. about the same

___ 6. ___ and _____ are examples of nonlegumes.

a. peas & beans b. lespedeza & alfalfa

c. fescue & bluegrass d. bluegrass & beans

___ 7. Concentrates are feeds that contain less than___ crude fiber.

a. 5% b. 18%

c. 50% d. 73%

___ 8. There are two kinds of concentrates: _____ and _____.

a. energy & protein b. energy & fat

c. protein & fat c. fat & vitamins

___ 9. Protein supplements may be_____or _____ products.

a. red or green b. vitamins or minerals

c. corn or beans d. animal or vegetable

___10. Commercial protein supplements often have vitamins, minerals and even ___ in the mix.

a. water b. antibiotics

c. hay d. grass

___11. ____ is an example of animal protein.

a. dried skimmed milk b. wheat

c. beet pulp d. wheat middlings

___12. _____ is an example of a vegetable protein.

a. bonemeal b. dried skimmed milk

c. corn gluten d. whole milk

___13. The tag on the feed will tell what the ______and which kind of animals should eat it. Be sure to follow the directions.

a. mix contains b. farmer's name is

c. mix tastes like d. brand name is

___14. Most grains are _____ feeds (less than 20% crude fiber).

a. expensive b. poor

c. animal d. energy

___15. Examples of energy feeds are: _____ and_____.

a. barley & dry milk b. barley & rye

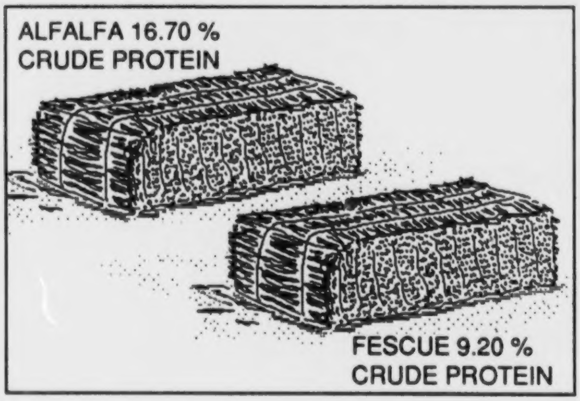
c. bonemeal & fishmeal d. milk & cheese

## E. HOW DO FEEDS DIFFER IN NUTRIENT CONTENT?

Each kind of feed that animals eat has different amounts of nutrients. For example:

| Nutrient | Alfalfa Hay Sun-Cured 1/10 Bloom Stage | Fescue Mid-maturity Stage |
|---|---|---|
| Crude Protein % | 16.7 | 9.20 |
| Net Energy, Therms/lb. | 0.55 | 0.40 |
| Calcium % | 1.66 | 0.28 |
| Phosphorus % | 0.24 | 0.28 |
| Crude Fiber% | 31.50 | 36.60 |
| Total Digestible Nutrients | 54.00 | 40.00 |

Notice the percent of crude protein and crude fiber in alfalfa hay as compared to fescue hay.


ALFALFA 16.70 %
CRUDE PROTEIN
FESCUE 9.20 %
CRUDE PROTEIN

Here is another chart that shows the nutrients in different feeds

**Table 41 Composition of Feeds Commonly Used in Dairy Cattle Rations**

**PART A. DRY FORAGES AND ROUGHAGES**

| | | | | | | | On a Dry Basis (Moisture Free) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Growing Dairy Cattle | | Lactating Cows | | | | | | | |
| Feed Name | NRC Feed Reference Number | Dry Matter (%) | DE (Mcal/kg) | ME (Mcal/kg) | $NE_m$ (Mcal/kg) | $NE_g$ (Mcal/kg) | $NE_l$ (Mcal/kg) | TDN (%) | Crude Protein (%) | Crude Fiber (%) | Acid Detergent Fiber (%) | Calcium (%) | Phosphorus (%) | Vitamin A (1,000 IU/kg) |
| 1. Alfalfa meal, dehydrated | 1-00-023 | 93 | 2.73 | 2.31 | 1.33 | 0.73 | 1.40 | 62 | 19.7 | 27 | 35 | 1.43 | 0.26 | 48 |
| 2. Alfalfa hay, sun-cured, midbloom | 1-00-063 | 89 | 2.47 | 2.04 | 1.19 | 0.51 | 1.25 | 56 | 16 | 33 | 40 | 1.35 | 0.22 | 10 |
| 3. Barley hay, sun-cured | 1-00-495 | 87 | 2.51 | 2.09 | 1.23 | 0.55 | 1.27 | 57 | 8.9 | 26 | – | 0.21 | 0.30 | 21 |
| 4. Bermudagrass, Coastal, hay, sun-cured | 1-00-716 | 91 | 2.11 | 1.68 | 1.03 | 0.19 | 1.05 | 48 | 6 | 34 | 35 | 0.46 | 0.18 | 25 |
| 5. Bluegrass, Canada, hay, sun-cured | 1-00-762 | 93 | 2.86 | 2.44 | 1.41 | 0.82 | 1.47 | 65 | 11.6 | 29 | – | 0.30 | 0.29 | 99 |
| 6. Bromegrass, hay, sun-cured, late bloom | 1-00-888 | 90 | 2.38 | 1.95 | 1.15 | 0.44 | 1.20 | 54 | 7.4 | 40 | 44 | 0.30 | 0.35 | 15 |
| 7. Clover, Alsike, hay, sun-cured | 1-01-313 | 88 | 2.65 | 2.22 | 1.29 | 0.66 | 1.35 | 60 | 14.7 | 29 | – | 1.31 | 0.25 | 15 |
| 8. Clover, Crimson, hay, sun-cured | 1-01-328 | 87 | 2.65 | 2.22 | 1.29 | 0.66 | 1.35 | 60 | 16.9 | 32 | – | 1.42 | 0.18 | 9 |
| 9. Clover, Ladino, hay, sun-cured | 1-01-378 | 91 | 2.69 | 2.27 | 1.31 | 0.69 | 1.37 | 61 | 23 | 19 | 32 | 1.38 | 0.24 | 25 |
| 10. Clover, Red, hay, sun-cured | 1-01-415 | 88 | 2.60 | 2.18 | 1.26 | 0.62 | 1.32 | 59 | 14.9 | 30 | 41 | 1.49 | 0.25 | 13 |
| 11. Corn fodder, sun-cured | 1-02-775 | 82 | 2.86 | 2.44 | 1.41 | 0.82 | 1.47 | 65 | 8.9 | 26 | 33 | 0.43 | 0.23 | 2 |
| 12. Corn stover, mature, sun-cured | 10-2-776 | 87 | 2.60 | 2.18 | 1.26 | 0.62 | 1.32 | 59 | 5.9 | 34 | 39 | 0.60 | 0.09 | 2 |
| 13. Corn cob meal, ground | 1-02-782 | 90 | 2.07 | 1.64 | 1.01 | 0.15 | 1.03 | 47 | 2.8 | 35 | 35 | 0.12 | 0.04 | 0 |
| 14. Cowpea, hay, sun-cured | 1-01-645 | 90 | 2.77 | 2.36 | 1.36 | 0.76 | 1.42 | 63 | 18.4 | 27 | – | 1.34 | 0.32 | |
| 15. Fescue, meadow, hay, sun-cured | 1-01-912 | 88 | 2.42 | 2.00 | 1.17 | 0.48 | 1.23 | 55 | 10.5 | 33 | 43 | 0.67 | 0.36 | 29 |
| 16. Oat, hay, sun-cured | 1-03-280 | 88 | 2.68 | 2.27 | 1.31 | 0.70 | 1.37 | 61 | 9.2 | 31 | 36 | 0.26 | 0.24 | 21 |
| 17. Orchardgrass, hay, sun-cured, late bloom | 1-03-428 | 88 | 2.20 | 1.78 | 1.07 | 0.28 | 1.10 | 50 | 8.4 | 37 | 39 | – | – | 8 |
| 18. Redtop, hay, sun-cured, midbloom | 1-03-886 | 93 | 2.65 | 2.22 | 1.29 | 0.66 | 1.35 | 60 | 12 | 25 | – | – | – | 2 |
| 19. Rice, hulls | 1-08-075 | 92 | 0.48 | 0.34 | 0.52 | 0 | 0.15 | 11 | 3.1 | 44 | 72 | 0.09 | 0.08 | 0 |
| 20. Ryegrass, Italian, hay, sun-cured, late vegetative | 1-04-065 | 89 | 2.73 | 2.31 | 1.33 | 0.73 | 1.40 | 62 | 10.3 | 24 | – | 0.62 | 0.34 | 116 |
| 21. Ryegrass, perennial, hay, sun-cured, early bloom | 1-04-075 | 84 | 2.73 | 2.31 | 1.33 | 0.73 | 1.40 | 62 | 6 | 35 | – | 0.65 | 0.37 | 48 |
| 22. Sorghum (Grain Sorghum Fodder), sun-cured | 1-07-960 | 90 | 2.55 | 2.13 | 1.24 | 0.58 | 1.30 | 58 | 7.4 | 28 | – | 0.47 | 0.19 | 21 |
| 23. Sorghum, Johnsongrass, hay, sun-cured | 1-04-407 | 91 | 2.46 | 2.01 | 1.19 | 0.51 | 1.25 | 56 | 9.6 | 33 | – | 0.71 | 0.31 | 17 |
| 24. Sorghum, Sudangrass, hay, sun-cured | 1-04-480 | 89 | 2.60 | 2.18 | 1.26 | 0.62 | 1.32 | 59 | 11 | 29 | 42 | 0.56 | 0.31 | 24 |

Modern Livestock & Poultry Production, by James R. Gillespie, page 799.

## DO SKILL SHEET 4

## BALANCED RATIONS

# SKILL SHEET 4

Fill in the missing information in the chart: Comparison of Hay Feed Values (As Feed Basis)

| Nutrient | Alfalfa Hay Sun-Cured 1/10 Bloom Stage | Fescue Mid-maturity Stage |
|---|---|---|
| Crude Protein % | 16.7 | 9.20 |
| Net Energy, Therms/lb. | | 0.40 |
| Calcium % | 1.66 | 0.28 |
| Phosphorus % | 0.24 | |
| Crude Fiber% | 31.50 | 36.60 |
| Total Digestible Nutrients | | |

Use the chart on page 26 to compare the percent of crude protein and vitamin A in red clover with the percent of those nutrients in corn fodder. Put your answers on the blanks below.

Red Clover

Crude protein__________

Vitamin A____________

Corn Fodder

Crude protein_________

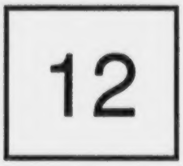
Vitamin A___________

## F. WHAT IS A PEARSON SQUARE?

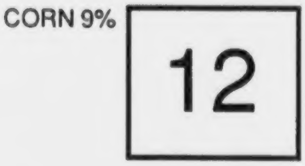
A Pearson Square is a formula you can use to balance a feed ration for animals. To balance a ration using a Pearson Square, follow these steps.

1. Find crude protein need for an animal. For example, a steer needs 12% crude protein.

2. Draw a square and put the steer's protein need in the center.

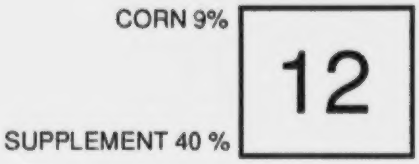


3. Beside the top left side of the square, write the percent of protein in the grain you are feeding. (Write the number and label the kind of grain.)

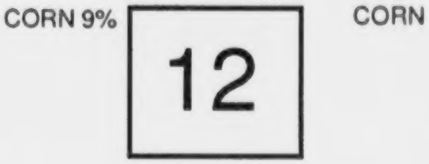


BEST COPY AVAILABLE

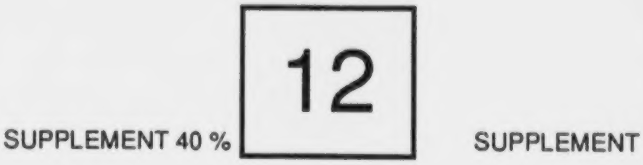
4. Beside the bottom left side of the square, write the percent of protein in the supplement you are using. (Write the number and the word supplement.)


CORN 9%
12
SUPPLEMENT 40 %

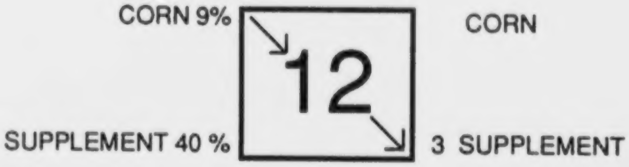
5. On the top right side of the square, write the same word that you had on the left top.


CORN 9%
12
CORN

6. On the bottom right side of the square write the same word that you had on the left bottom.

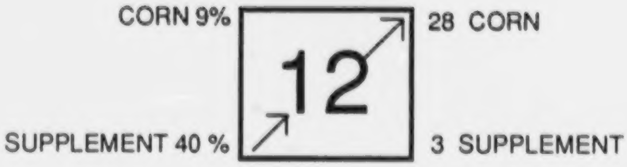

12
SUPPLEMENT 40 %
SUPPLEMENT

7. Using the top left number and the middle number, subtract the smaller number


CORN 9%
CORN
12
SUPPLEMENT 40 %
3 SUPPLEMENT

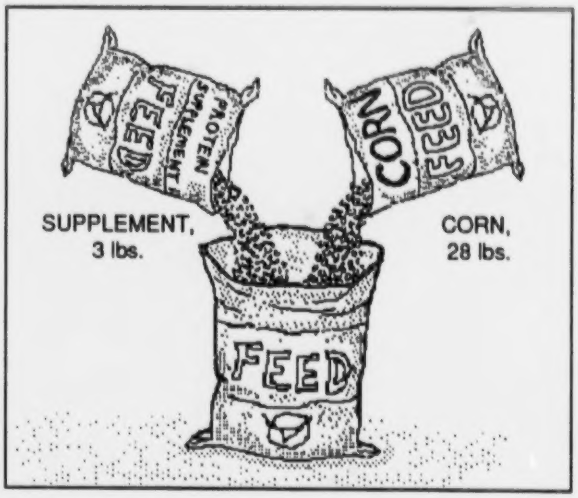
from the larger number. Write the answer on the bottom right corner. (Work **diagonally**.)

8. Using the bottom left number and the middle number, subtract the smaller number from the larger number and write the answer on the top right corner. (Work **diagonally**.)


CORN 9%
12
28 CORN
SUPPLEMENT 40 %
3 SUPPLEMENT

9. Add the two right side numbers. 28 + 3 = 31

10. This means that in 31 pounds of feed there would be 28 pounds of corn and 3 pounds of supplement.


PROTEIN SUPPLEMENT FEED
CORN FEED
SUPPLEMENT, 3 lbs.
CORN, 28 lbs.
FEED

11. If you wanted to mix 100 pounds of feed, divide each of the pounds by 31 and multiply by 100. That tells you how many pounds of grain or supplement you need in the 100 pounds of mix.

28/31 X 100 = 90.3 lbs.
corn

3/31 X 100 = 9.7 lbs.
supplement

**DO SKILL SHEET 5**

BALANCED RATION

## SKILL SHEET 5

**Problem**: Find the proper mix of crude protein for a steer that needs 12% crude protein, if the grain has 10% and the supplement has 40%.

Follow these steps and draw a Pearson Square on a separate sheet of paper.

1. Draw a square and put the crude protein needed by the steer in the center.
2. Beside the top left side of the square, write the percent of protein in the grain. (Write the number and label it "grain.")
3. Beside the bottom left side of the square, write the percent of protein in the supplement. (Write the number and the word "supplement.")
4. On the top right side of the square, write the same word that you had on the left top.
5. On the bottom right side of the square, write the same word that you had on the left bottom.

6. Using the top left number and the middle number, subtract the smaller number from the larger number and write the answer on the bottom right corner. (Work diagonally.)
7. Using the bottom left number and the middle number, subtract the smaller number from the larger number and write the answer on the top right corner. (Work diagonally.)
8. Add the two right side numbers.
9. Use the information on your square to finish these statements.

This means that in________pounds of feed, there would be ______ pounds of grain and ________ pounds of supplement.

Now find how many pounds of grain and how many pounds of supplement you would need to mix to make 100 pounds of feed.

Grain________

Supplement________

## G. HOW DO YOU USE THE PEARSON SQUARE TO BALANCE RATIONS?

Problem: Formulate a 12% crude protein concentrate for a steer. Use a 40% crude protein supplement. Use a mix of two grains: two parts milo and one part corn.

GRAIN
FEED
CORN
MILO
FEED
PROTEIN
SUPPLEMENT
FEED

When you are feeding more than one grain plus a supplement:

1 Calculate the crude protein in grain #1 (milo) and grain #2 (corn).

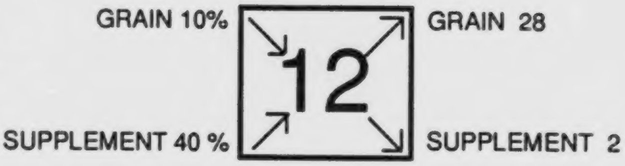
Grain #1 - Milo has 10.5% crude protein. (2 X 10.5) = 21

Grain #2 - Corn has 9.0% crude protein. (1 X 9.0) = 9

The total is 30.

2. Take the average of the protein in the two grains. The total protein is 30. Divide by the parts (3). 30 divided by 3 = 10%

3. Work a Pearson Square the same way you did before.


GRAIN 10%
GRAIN 28
12
SUPPLEMENT 40 %
SUPPLEMENT 2

4. Find the percent of grain by adding the right sides of the Pearson Square.

| | |
|---|---|
| Grain | 28 |
| Supplement | 2 |
| Total | 30 |

5. Find out how many pounds of grain in a 100 pound mixture.

Grain 28/30 X 100 = 93.3
Supplement 2/30 X 100 = 6.7

6. Multiply the grain pounds by the parts of grain #1 to find how much of grain #1 to use.

93.3 X 2/3 = 63.2 lbs. milo

7. Multiply the pounds of grain by the parts of grain #2 to find how much of grain #2 to use.

93.3 X 1/3 = 31.1 lbs. corn

8. Now you know how much of each to use:

93.3 X 2/3 = 63.2 lbs. milo
93.3 X 1/3 = 31.1 lbs. corn
2/30 X 100 = 6.7 lbs. sup.
100.0 lbs. mix

**DO SKILL SHEET 6**

BALANCED RATIONS

# SKILL SHEET 6

Problem Formulate a 12% crude protein concentrate for a steer. Use a 40 percent crude protein supplement. Use a mix of two grains: two parts milo and one part corn.

Follow these steps and draw a Parson Square on a separate sheet of paper.

1. Calculate the crude protein in grain #1 (milo) and grain #2 (corn).

2. Take the average of the protein in the two grains (total divided by the parts).

3. Work a Pearson Square the same way you did before.

4. Find the percent of grain by adding the right sides of the Pearson Square.

5. Find out how many pounds of each grain in a 100 pound mixture.

## BALANCED RATION

# UNIT TEST

Part 1. Explain the difference between a ration and a balanced ration.

1. A ration...

2. A balanced ration...

Part 2. Place a "T" in front of statements that are true about balanced rations. Place an "F" in front of statements that are false about balanced rations.

___ 3. Four-hundred-pound calves should be given about 6 lbs. of alfalfa-grass hay and about 4 lbs. of grain mix of 9.8% crude protein.

___ 4. If less crude protein is fed in the hay, more crude protein should be fed in the grain mix.

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___ 5. Corn silage can be fed to calves without any hay or grain. Alone the corn provides a balanced ration.

___ 6. Trace mineral salt should be included in a balanced ration for cattle.

___7. Some grain mixes for calves have selections from the following grains: oats, corn, barley or soybean meal.

Part 3 Choose the answer that best completes each statement about why balanced rations are needed.

___ 8. Balanced rations are needed in order for the animal to

a. have a full stomach.
b. use up excess hay and grain.
c. in order for the body to maintain tissue repair and for organs to function properly.
d. all of the above

___ 9. If rations for gestating animals are not balanced,

a. there may be deformed babies.
b. babies may not weigh as much.
c. some of the babies may be born dead.
d. all of the above

___10. When animals are lactating (making milk), balanced rations are

a. needed to build nutrient reserves before birth.

b. needed to continue to produce milk after birth.

c. need to be added to the milk.

d. both a and b

___11. Balanced rations are necessary

a. for growth of mature animals.

b. for growth of immature animals.

c. to keep animals from getting too big.

d. to keep animals small and petite.

Part 4. Answer the following question completely.

12. We need a 12% crude protein mixture in a concentrate mix for steers. How many pounds of corn, 9% crude protein, and supplement, 40% crude protein, are needed in a 100 lb. mixture. Use a Pearson Square and show your calculations.

BALANCED RATION

# PERFORMANCE CHECKLIST

Student____________________successfully performed the following tasks:

| TASK | YES | NO | COMMENTS |
|---|---|---|---|
| 1. Explained why protein is one of the most important of the six nutrients in a balanced ration. | | | |
| 2. Told why the protein needs of different animals vary. | | | |
| 3. Listed types of feeds and supplements. | | | |
| 4. Explained how feeds differ in nutrient content. | | | |
| 5. Identified a Pearson Square. | | | |
| 6. Used a Pearson Square to balance rations | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

____________________
Student's Signature/Date

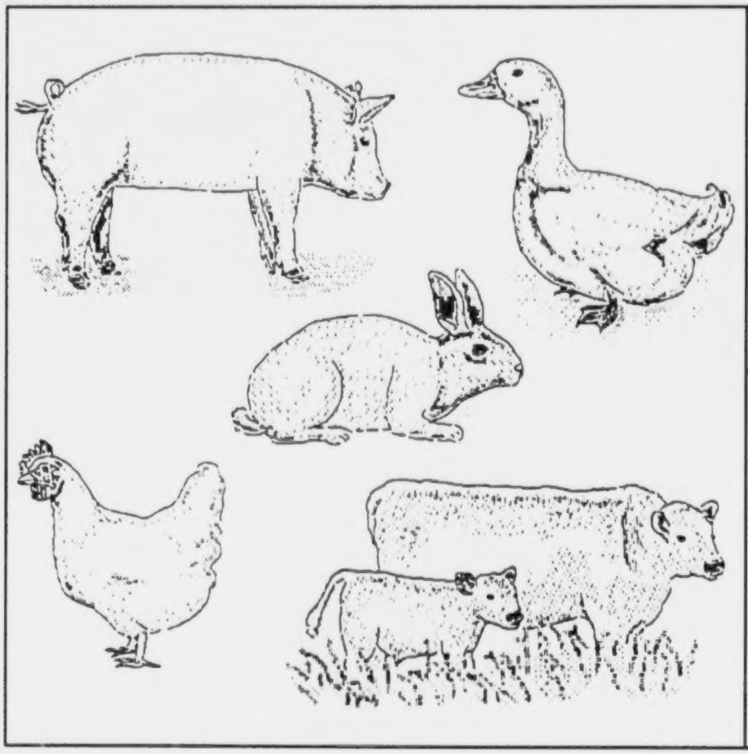
____________________
Instructor's signature/Date

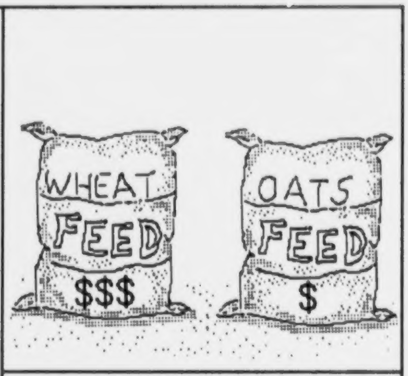
90-1400-S

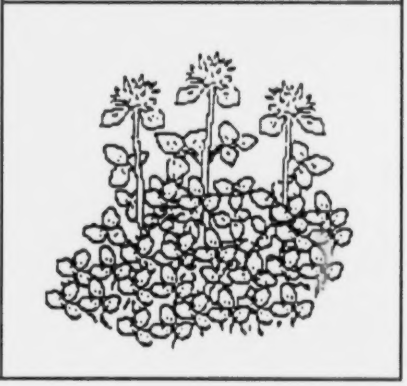
# Agricultural Science I

## SUPPLEMENTARY UNITS

## Guidelines for Feeding Livestock




WHEAT
FEED
$$$
OATS
FEED
$



Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

GUIDELINES FOR FEEDING LIVESTOCK

## INTRODUCTION

Proper feeding is important in raising animals. The type of animal, its age and weight, and the purpose for which it is being raised will determine what kind of nutrients it needs. However, some general suggestions about feeding animals usually apply.

## OBJECTIVE

After completion of this unit, you should be able to list some general suggestions about feeding livestock.

## STUDY QUESTIONS

After completion of this unit, you should be able to answer the following questions:

1. What are four general principles for feeding livestock?
2. How do you use nutrient tables to find the nutrient requirements for different animals?
3. How do an animal's nutritional needs change as it ages?

4. What are some rules of thumb for feeding cattle, swine, sheep and goats, horses and poultry?

5. What questions should you consider when deciding what feeds to use in a balanced ration?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

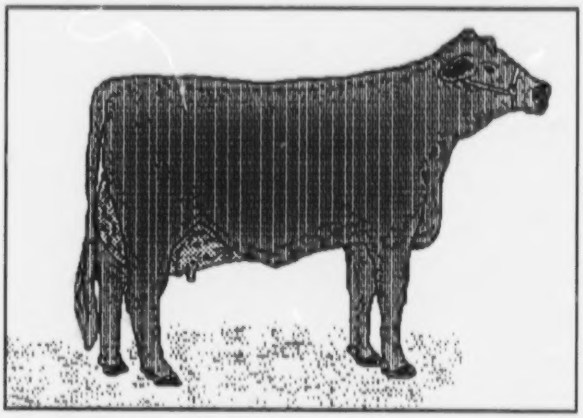
## A. TERMS

1. **Species** - (spe-sees) a distinct kind of animal or plant.
2. **Rumen** - (ru-men) the first compartment of a ruminant's four-part stomach, also called the paunch.
3. **Gestating** - (jes-tay-ting) pregnancy.
4. **Lactating** - (lak-tay-ting) making milk.
5. **Air-dried concentrates** - (air dried con-sen-trat-s) feed containing less than 18 percent crude fiber and more than 60 percent total digestible nutrients. Feeds that have more than 80 percent dry matter are considered air-dry.
6. **Dry matter** - (dri mat-ter) the part of the feed that is not water.

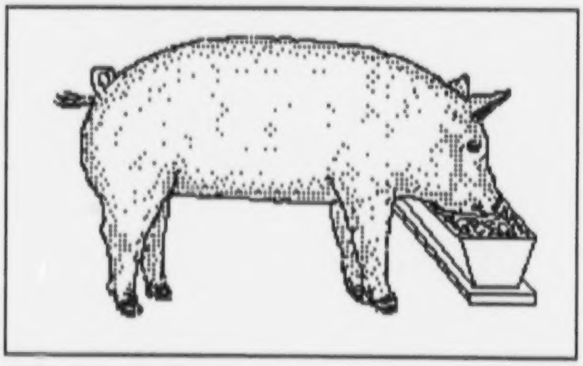
## B. WHAT ARE FOUR PRINCIPLES FOR FEEDING LIVESTOCK?

1. Animal **species** differ in the nutrients they need.

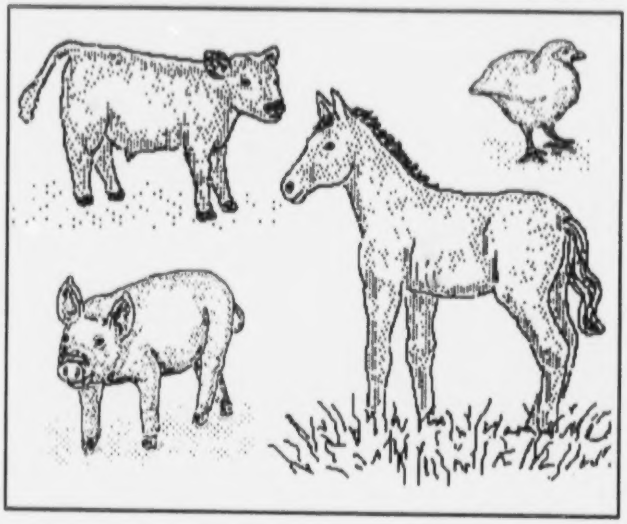
   Cattle, for example, need nitrogen so they can manufacture amino acids (protein). Cattle make their own vitamin B.



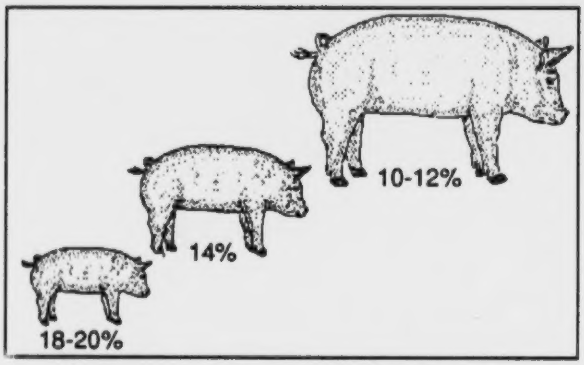
   Swine, on the other hand, must be fed protein feeds and at least six of the B vitamins.



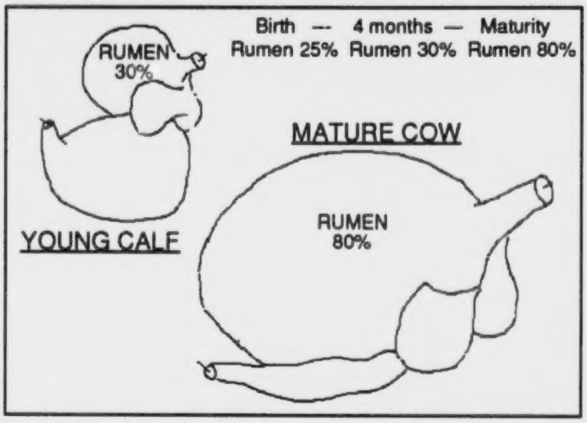
2. Nutrient needs for the same kind of animal change depending on the animal's age and the purpose for which you are raising it.



Young animals need lots of nutrients in order to grow.

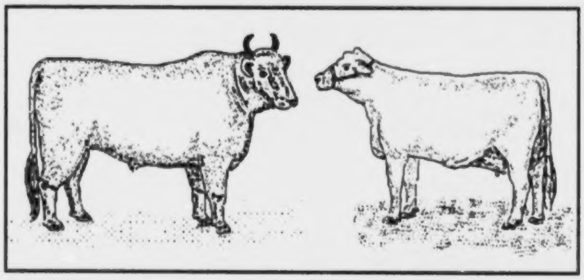

10-12%
14%
18-20%

As a pig matures, it needs less protein.

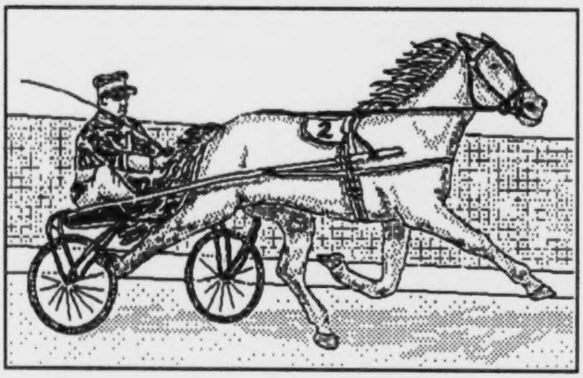

Birth — 4 months — Maturity
Rumen 25% Rumen 30% Rumen 80%
RUMEN 30%
YOUNG CALF
MATURE COW
RUMEN 80%

As its **rumen** develops, a calf can eat more roughage.

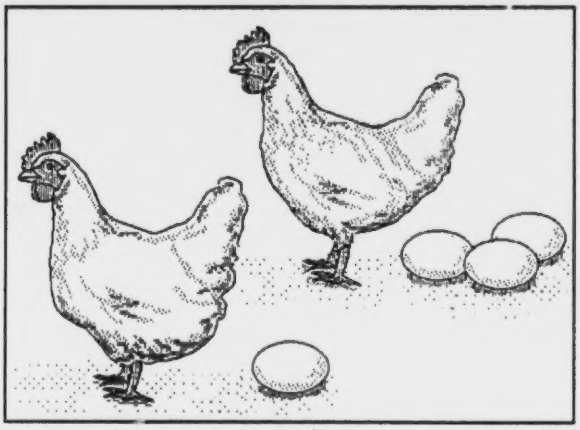
Cattle used for herd replacement do not need as big a ration as cattle being raised for market.



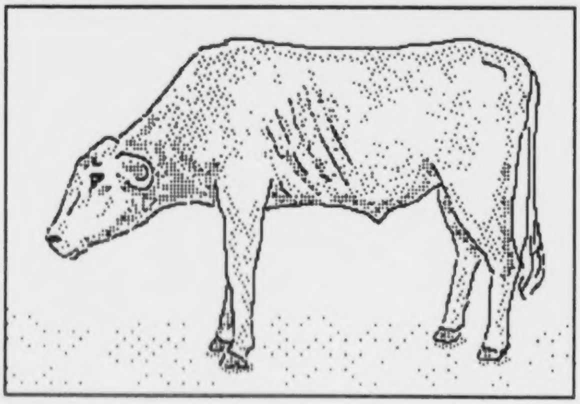
3. Animals need specific nutrients. Leaving some out or supplying too many of others causes problems.



The correct nutrients promote growth, production and performance in livestock.

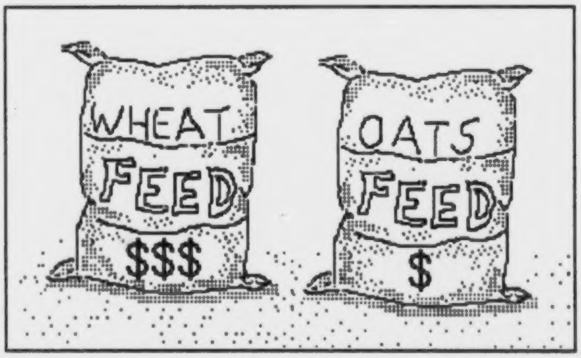


Overfeeding, for example, reduces reproduction. Overfed poultry lay fewer eggs.



Lack of a single necessary nutrient can cause poor performance, sickness and inferior reproduction.

4. Many nutrient sources are available. When choosing a feed, pick one that will give you the desired performance at the least cost.



When the price of one type of feed goes up, you can choose a different, cheaper feed that will provide the same type nutrients.

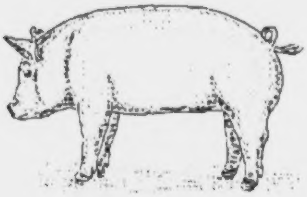
**DO SKILL SHEET 1**

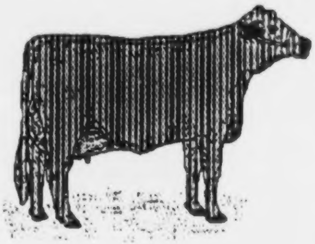
GUIDELINES FOR FEEDING LIVESTOCK

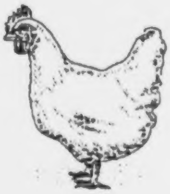
## SKILL SHEET 1

Part 1. Choose the picture that answers the question best.

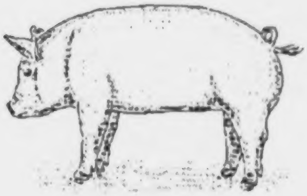
___ 1. Which animal produces protein and vitamin B in its own body?

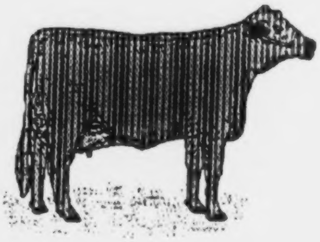
a.


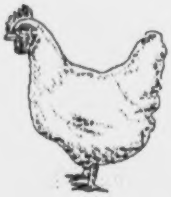
b.


c.


___ 2. Which animal needs to be fed supplements of protein and vitamin B because it doesn't make them in its body?

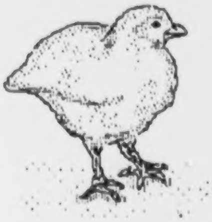
a.


b.


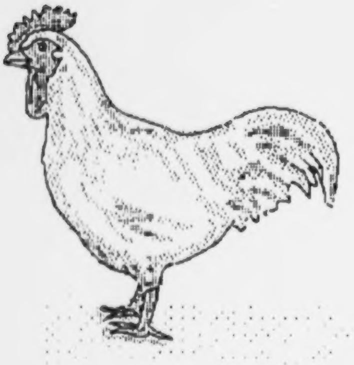
c.


___ 3. Which animal needs more nutrients?

a.

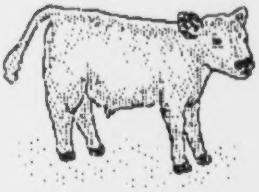


b.

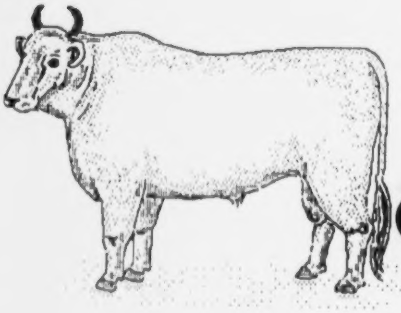


___ 4. Which animal can eat more roughage (hay)?

a.

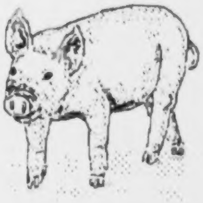


b.

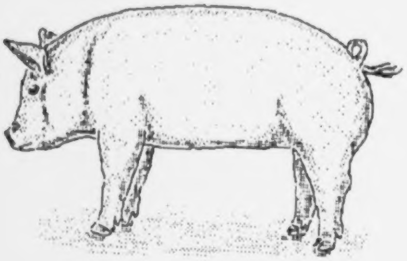


___ 5. Which animal needs more protein?

a.

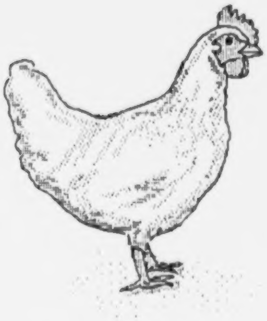


b.

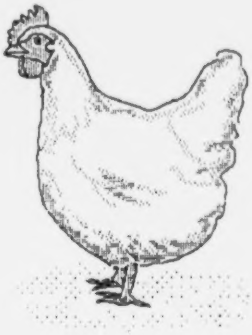


___ 6. Which hen will probably lay more eggs?

a.

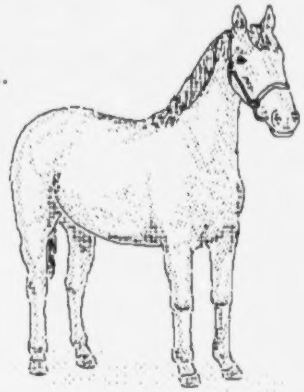


b.

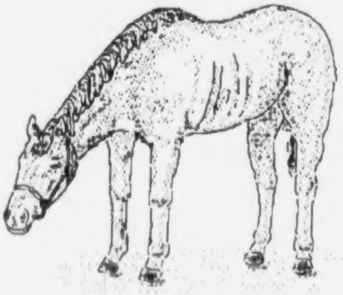


___ 7. Which of these animals may be missing an important nutrient?

a.

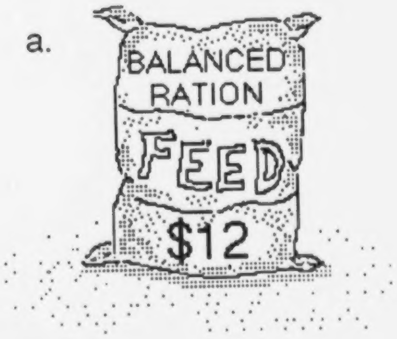


b.



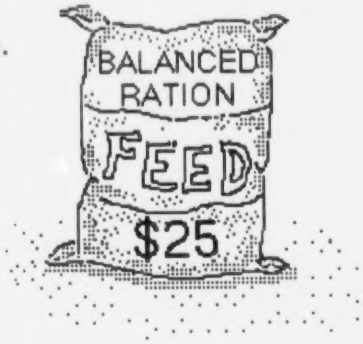
___ 8. Which feed should you choose?

a.



BALANCED
RATION
FEED
$12

b.



BALANCED
RATION
FEED
$25

Part 2. You learned four general principles of feeding livestock. Use the words below to fill in the blanks of those four principles.

age
desired performance
leaving some out
purpose
differ
supplying too much
specific
least cost
nutrients
problems

9. Species__________ in the __________ they need.

10. Nutrient needs for the same kind of animal change depending on the animal's___________ and the ____________ for which you are raising it.

11. Animals need ____________nutrients. _______ ______ ________ or_______ _________ _______ of others causes problems.

12. Many nutrient sources are available. When choosing a feed, pick one that will give you the __________ ________ at the __________ _______.

## C. HOW DO YOU USE NUTRIENT TABLES?

Nutrient tables show the nutrient requirements for a specific type of animal according to its weight and expected weight gain. A partial nutrient requirements table for growing finishing heifer calves and yearlings like the one below lists daily nutrients per animal. This table is adapted from one produced by the National Research Council, National Academy of Science.

| Weight lbs. | Daily Gain | Min. Dry Matter | Rough-age % | Total Protein | Digest-able Protein | Calcium (grams) | Vitamin A (1000) U |
|---|---|---|---|---|---|---|---|
| 220 | 0 | 4.6 | 100 | 0.40 | 0.22 | 4 | 5 |
| | 1.1 | 6.6 | 70-80 | 0.82 | 0.55 | 14 | 6 |
| | 1.5 | 6.4 | 50-60 | 0.93 | 0.64 | 19 | 6 |
| | 2.0 | 6.6 | 25-30 | 1.06 | 0.75 | 24 | 7 |
| | 2.4 | 6.6 | 15 | 1.17 | 0.86 | 29 | 7 |
| 331 | 0 | 6.2 | 100 | 0.53 | 0.31 | 5 | 6 |
| | 1.1 | 9.0 | 70-80 | 0.99 | 0.64 | 14 | 9 |
| | 1.5 | 8.8 | 50-60 | 1.10 | 0.73 | 18 | 9 |
| | 2.0 | 8.8 | 25-30 | 1.19 | 0.82 | 23 | 9 |
| | 2.4 | 8.8 | 15 | 1.32 | 0.93 | 28 | 9 |
| 441 | 0 | 7.7 | 100 | 0.66 | 0.37 | 6 | 8 |
| | 1.1 | 13.2 | 80-90 | 1.28 | 0.77 | 14 | 13 |
| | 1.5 | 13.2 | 70-80 | 1.34 | 0.86 | 18 | 13 |
| | 2.0 | 11.7 | 35-45 | 1.37 | 0.88 | 22 | 13 |
| | 2.4 | 11.0 | 15 | 1.41 | 0.95 | 25 | 13 |
| 551 | 0 | 9.0 | 100 | 0.77 | 0.44 | 7 | 9 |

**DO SKILL SHEET 2**

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GUIDELINES FOR FEEDING LIVESTOCK

## SKILL SHEET 2

Use the nutrient table for heifer calves and yearlings (page 13) to answer these questions.

1. If the feed was 100% roughage for a 220-pound heifer, what would the expected daily weight gain be (in pounds)?

2. For the same 220-pound heifer, how many total pounds of protein would you need to feed for a two-pound daily gain?

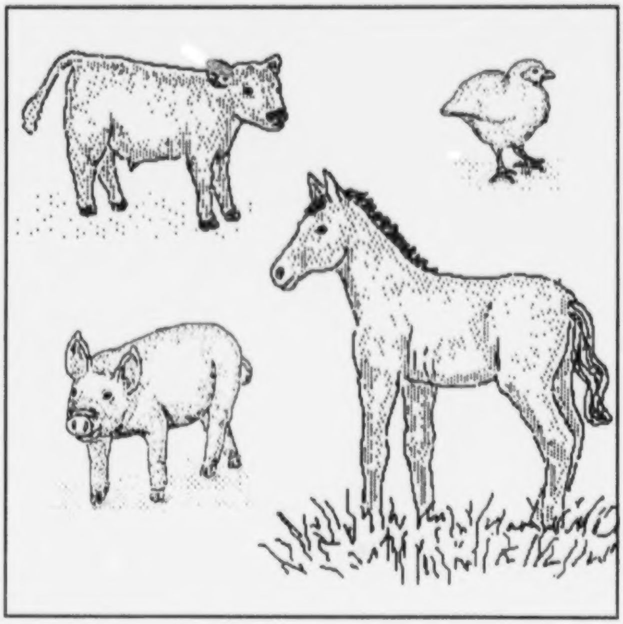
3. How many units of Vitamin A would the same heifer need for the same gain?

4. What is the minimum dry matter consumption for a 441-pound heifer that you want to gain a pound and a half a day?

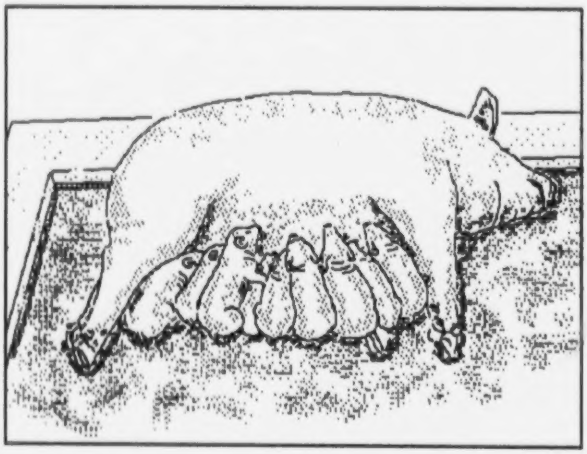
5. How much calcium does a 220-pound heifer calf need in order to gain a pound and a half a day?

## D. HOW DO ANIMAL'S NUTRITIONAL NEEDS CHANGE WITH AGE?

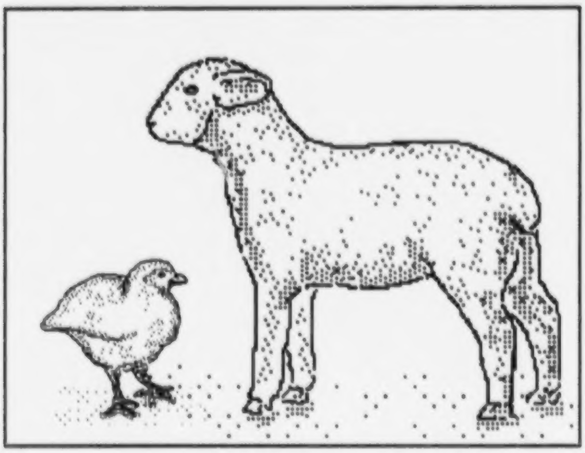
1. Young animals need more nutrients than adults. Animals grow fast when they are young. Babies need extra nutrients to promote healthy growth of bones, muscles, organs, connective tissue and all other tissue. The rate of growth slows down as the animal gets older. Therefore, it does not need as many nutrients.



2. An animal's nutritional needs depend on what it's doing. Animals need more nutrients when they are growing, **gestating, lactating**, working or being fattened for market.



3. Large animals usually take longer to mature than small animals. Therefore, large animals require more nutrients for a longer period of time than do small animals.



**DO SKILL SHEET 3**

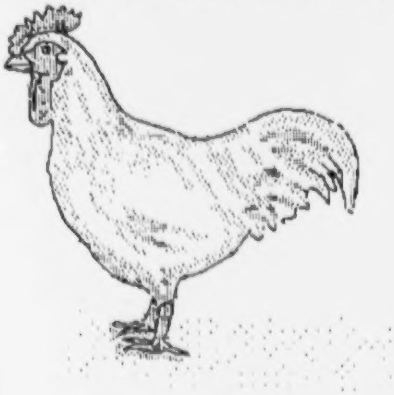
## GUIDELINES FOR FEEDING LIVESTOCK

# SKILL SHEET 3

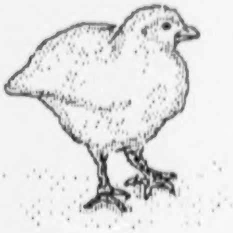
Part 1. Choose the picture that best answers the question. Then on the long blank tell why you chose that picture

___ 1. Which animal needs the most nutrients?

A.



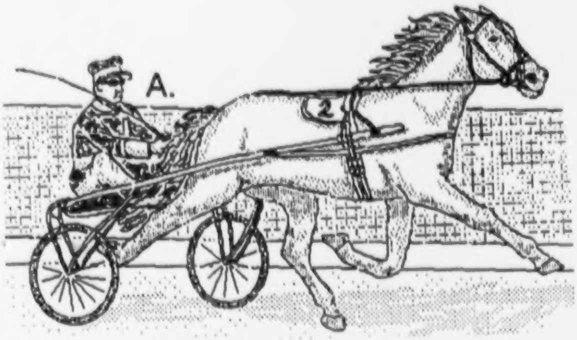
B.



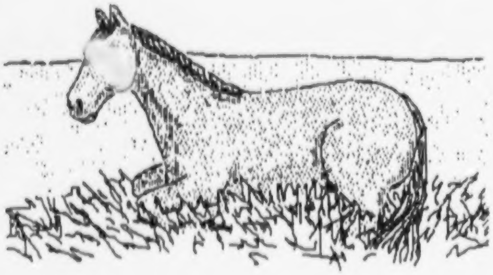
Why? ______________________________

___ 2. Which animal needs the most nutrients?

A.



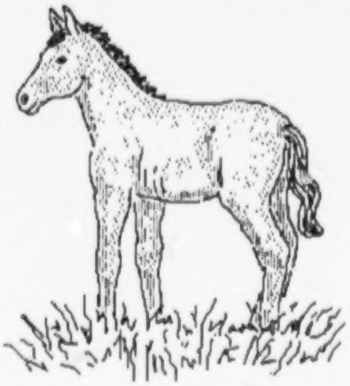
B.



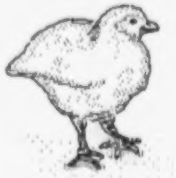
Why? ______________________________

___ 3. Which animal needs the most nutrients?

A.



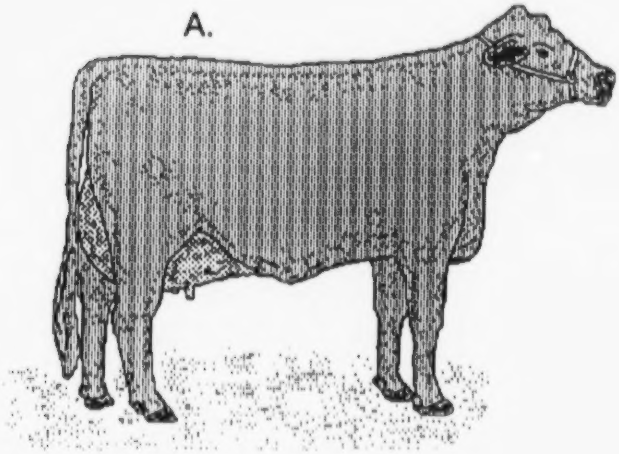
B.



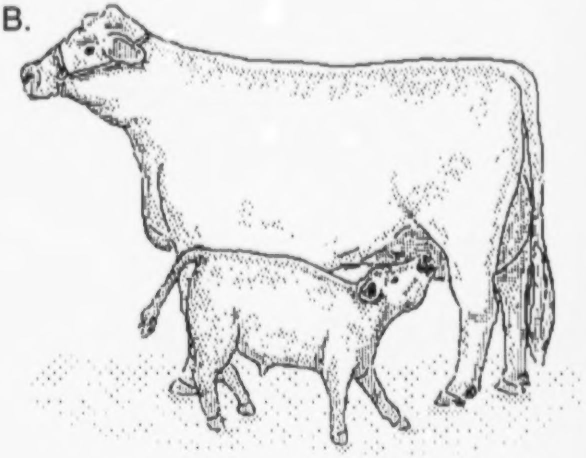
Why? ______________________________

___ 4. Which animal needs the most nutrients?

A.



B.

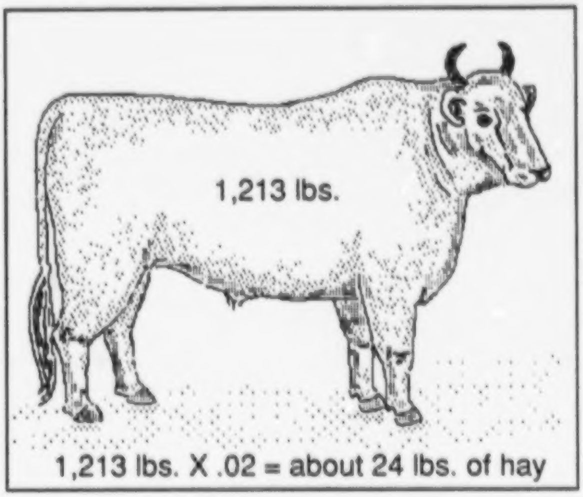


Why ______________________________

## E. WHAT ARE SOME RULES OF THUMB FOR FEEDING CATTLE, SWINE, SHEEP AND GOATS, HORSES AND POULTRY?

### 1. CATTLE

a. For maintenance, feed cattle 1.8 to 2% of body weight in hay (roughage). Also feed 1 1/2 to 2 pounds of oil meals (protein) or three times that much alfalfa or legume hay.

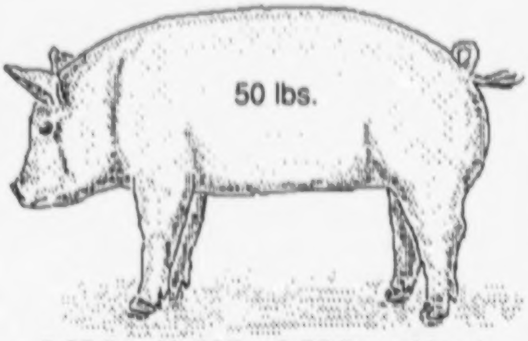

1,213 lbs.
1,213 lbs. X .02 = about 24 lbs. of hay

b. For cows nursing calves in a drylot, feed 50% more than dry cows. When substituting silage for hay, use three (3) parts silage for one (1) part hay.

c. When you are fattening beef, feed 1.5 to 3% body weight. About 60% of that feed should be concentrates (grain) and 40% should be roughage (hay).

2. **SWINE**

a. Feed growing finishing pigs at 50 pounds about 6.5% of their body weight with 16% crude protein. They need less feed as they grow.

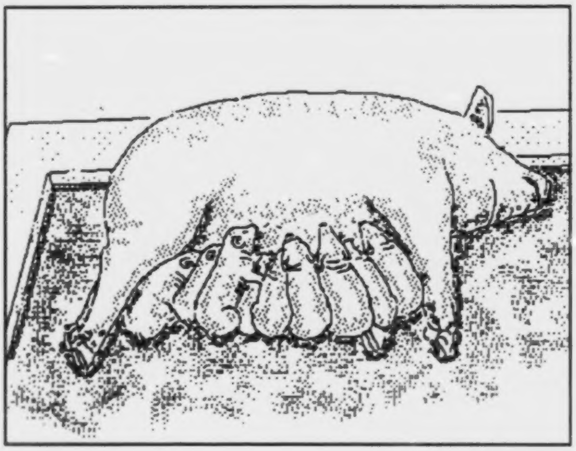


3.25 lbs. X .065 = 3.25 lbs. of feed
3.25 lbs. feed X .16 = .5 lb. protein

| Pig's weight | Percent of feed per body weight | Protein |
|---|---|---|
| 50 lbs. | 6.5% | 16% |
| 100 lbs. | 5.5 % | 14% |
| 170 lbs. | 3.5% - 4.5% | 13% |

b. Bred sows and gilts need about 3.5 to 4.5 pounds of **air-dried** feed containing about 14% crude protein.

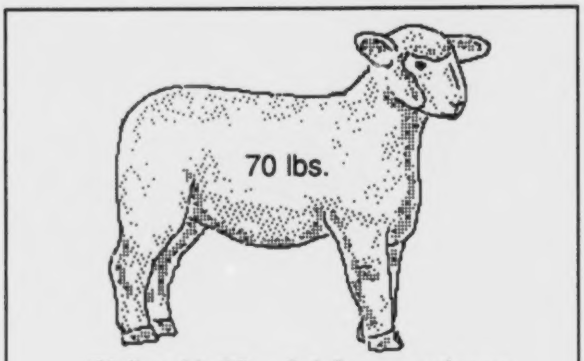
c. Nursing sows need about 10 - 15 pounds of **air-dried** feed or 9 - 13.5 pounds of **dry matter** based on 15% crude protein.



3. **SHEEP AND GOATS**

Sheep and goats need about 3% of their body weight in **air-dried** roughage or 2.5% dry matter and supplements for maintenance.

For example a 70 lb. sheep needs 2.1 lbs. of **air-dried** roughage.

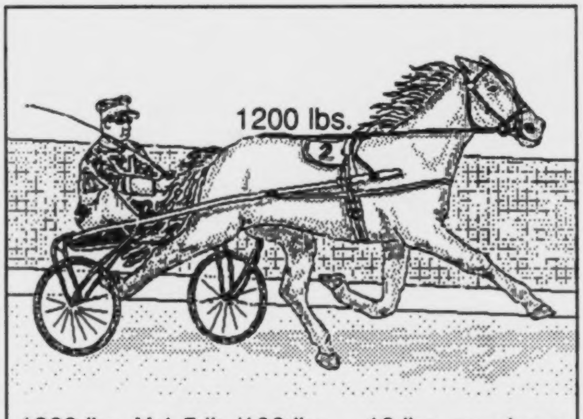


70 lbs. X .03 = 2.1 lbs. roughage

## 4. HORSES

Feed for horses is based on the amount of work the animal is doing.

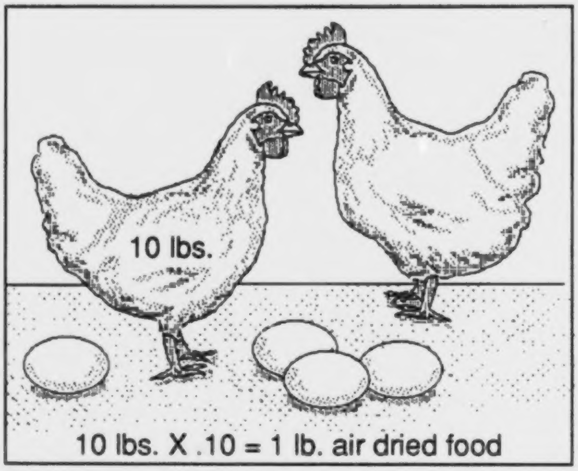
a. Horses doing medium work for three - four hours per day need about 1.0 -1.5 lbs. of roughage and .66 to 1.0 lb. of grain for each 100 lbs. they weigh.



1200 lbs. X 1.5 lb./100 lbs. = 18 lbs. roughage

## 5. POULTRY

Poultry eat mostly grain and protein supplements. Laying hens need lots of calcium in order to produce strong egg shells.



10 lbs. X .10 = 1 lb. air dried food

Feed 10% body weight in air-dried feed or 9% dry matter.

**DO SKILL SHEET 4**

## GUIDELINES FOR FEEDING LIVESTOCK

# SKILL SHEET 4

Match the rules of thumb for feeding with the kinds of animals to which they apply.

cattle sheep & goats horses

swine poultry

____________ 1. 1.8 to 2% of body weight in hay (roughage)

____________ 2. feed 1 1/2 to 2 pounds of oil meals (protein)

____________ 3. 6.5% of their body weight with 16% crude protein

____________ 4. to fatten, feed 1.5 to 3% body weight with 60% being concentrates (grain) and 40% roughage (hay)

___________ 5. about 3% body weight in air-dry roughage or 2.5% dry matter and supplements should be fed for maintenance

___________ 6. 10 to 15 lbs of air-dry feed or 9 to 13.5 lbs of dry matter based on 15% crude protein

___________ 7. eat mostly grain and protein supplements

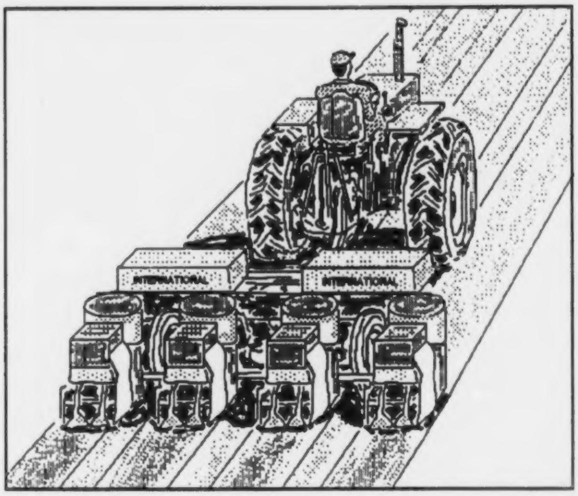
___________ 8. medium work for three to five hours per day need about 1.0 to 1.5 lbs. of roughage and .66 to 1.0 lbs of grain for each 100 lbs. they weigh

___________ 9. need lots of calcium in order to produce egg shells

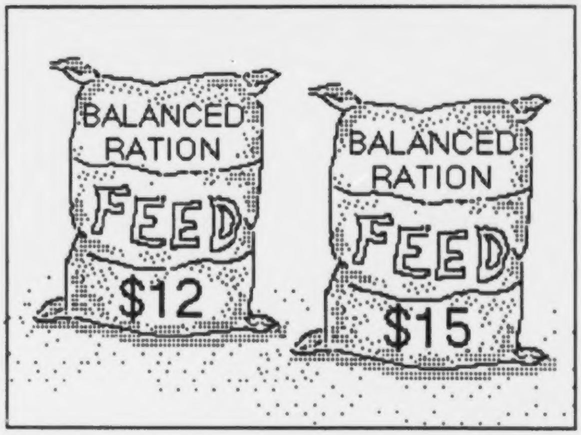
___________10. feed 10% body weight in air-dry feeds or 9% dry matter

## F. WHAT QUESTIONS SHOULD YOU CONSIDER WHEN DECIDING WHAT FEEDS TO USE IN A BALANCED RATION?

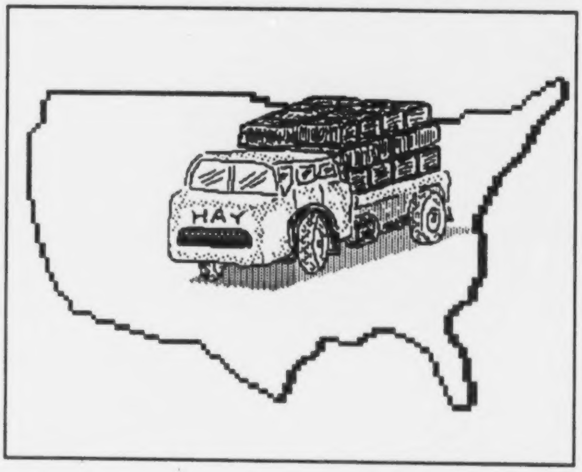
1. The place the feed is grown is important. Usually feeds that are home-grown are cheaper than those you buy from someone else.



2. Prices of feeds often change. Be sure that the two feeds you are comparing have equal nutrients. Then buy the one that is the cheapest.



3. Some types of feed are more plentiful in one part of the country than another. Scarcity causes the price to increase. Buy feeds plentiful in your area.



## DO SKILL SHEET 5

## GUIDELINES FOR FEEDING LIVESTOCK

# SKILL SHEET 5

Draw a line to connect the correct parts of each statement.

| **List 1** | **List 2** |
|---|---|
| Usually feeds that are homegrown | from time to time. |
| Prices of feeds change | are cheaper than those you buy from someone else. |
| Find the cheapest feed | that has comparable nutrients. |
| Scarcity causes an | more plentiful in some parts of the country than others. |
| Some feeds are | increase in price. |

### GUIDELINES FOR FEEDING LIVESTOCK

## UNIT TEST

Part 1. List four general principles for feeding livestock.

1.

2.

3.

4.

Part 2. Mark each statement below with a (T) for true or an (F) for false.

___ 5. All animals need protein.
___ 6. All animals need vitamins.
___ 7. Not all animals need minerals.
___ 8. Animals grow faster when they get older.

___ 9. An animal nursing young doesn't need any more nutrients than one that isn't.

___10. Usually larger animals take longer to mature than smaller animals.

___11. A good rule of thumb is to feed cattle about 2% of their body weight in hay.

___12. To fatten cattle, feed 1.5% of their body weight in grain and roughage.

___13. 170-pound pigs should be fed 13% of their body weight in protein.

___14. Bred sows and gilts should eat about 3.5 to 4.5 lbs. of feed containing 14% crude protein.

___15. For maintenance, sheep and goats need about 3% of their body weight in roughage.

___16. Horses that are working hard don't need more feed than a horse that runs free in the pasture.

___17. Laying hens need lots of calcium.

___18. You can usually buy feeds cheaper than you can raise them.

___19. Corn prices stay the same all the time.

___20. Oats may be more plentiful in some parts of the country than in others.

GUIDELINES FOR FEEDING LIVESTOCK

# PERFORMANCE CHECKLIST

Student___________________________successfully performed the following tasks:

| TASK | YES | NO | COMMENTS |
|---|---|---|---|
| 1. Explained four general principles for feeding livestock. | | | |
| 2. Used a nutrient table to find the nutrient requirements for an animal. | | | |
| 3. Explained how an animal's nutritional needs change as it ages. | | | |
| 4. Defined rules of thumb for feeding cattle, swine, sheep, goats, horses and poultry | | | |
| 5. Listed questions to consider when choosing a feed in a balanced ration. | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

____________________
Student's Signature/Date

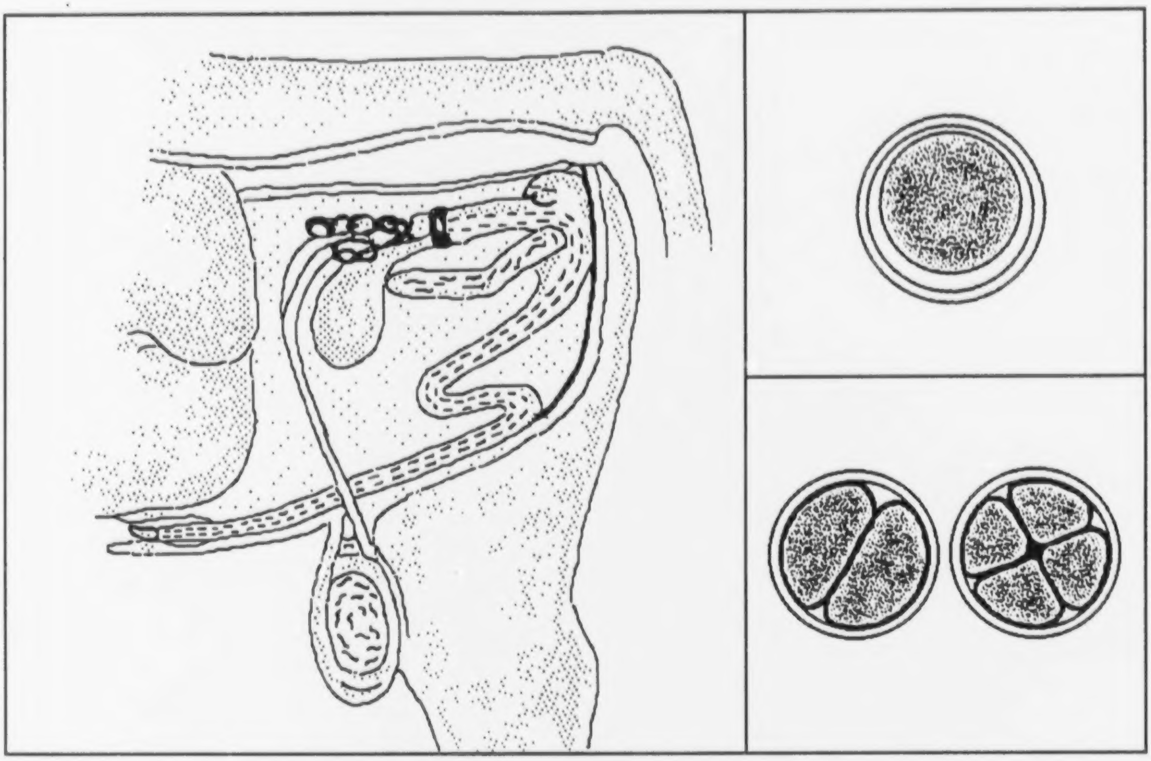
____________________
Instructor's Signature/Date

90-1400-S

# Agricultural Science I

## SUPPLEMENTARY UNITS

## Male Reproduction



Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

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## INTRODUCTION

To raise animals, you need special information about breeding. You need to understand how the male reproductive system works. Each part of the reproductive system has a job to do. For an animal to breed, all the reproductive parts must be healthy.

## OBJECTIVE

After you complete this unit, you should be able to name the parts of the male reproductive system in cattle and swine and explain their functions.

## STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. What are the parts of the male reproductive system?
2. What is the function of each part?
3. What are the differences between the reproductive systems of the bull and boar?

Put a check beside the statement that is true for you.

☐ I can do these tasks and want to go through the Performance Checklist.

SEE YOUR INSTRUCTOR

☐ I want to study the information in this unit before I do the Performance Checklist.

TURN PAGE AND BEGIN

## A. TERMS

1. **Testes** - (tess-tees) also called testicles, organs that make sperm cells and the male sex hormone testosterone.
2. **Scrotum** - (scrow-tum) a sac of skin holding and protecting the testes.
3. **Epididymis** - (ep-e-did-e-muss) a long, coiled tube that stores and moves the sperm cells. The epididymis is connected to each testes.
4. **Urethra** - (yer-e-thrah) passageway for semen. The urethra also carries urine from the bladder.
5. **Semen** - (see-men) mixture of sperm and fluids.
6. **Sperm cells** - (spur-m cells) male sex cells.
7. **Cowper's gland** - (cow-purrs gland) a gland that gets the urethra ready for the passage of the sperm cells.
8. **Prostate gland** - (pross-tate gland) a gland near the urethra and bladder that gives nutrition or food to the sperm cells.
9. **Seminal vesicles** - (sem-i-null vess-i-culls) small sacs that make and release the seminal fluid or semen. The seminal vesicles are connected to the urethra.
10. **Ejaculation** - (e-jack-u-la-shun) the process that causes semen to be released by the male, especially for deposit into the female.

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11. **Penis** - (pea-nus) male sex organ that places the semen into the female and through which urine passes.

12. **Sheath** - (shee-th) the skin covering the penis.

13. **Vas deferens** - (vahss deaf-er-ens) the passageway for sperm from the testicle to the penis.

14. **Bladder** - (blad-der) an expanding sac of tissue that holds the urine after it leaves the kidneys.

15. **Retractor muscle** - (ree-trak-tor muss-ul) the muscle that moves the penis backwards.

16. **Sigmoid flexure** - (sig-moyd fleck-shure) the muscle that moves the penis forward.

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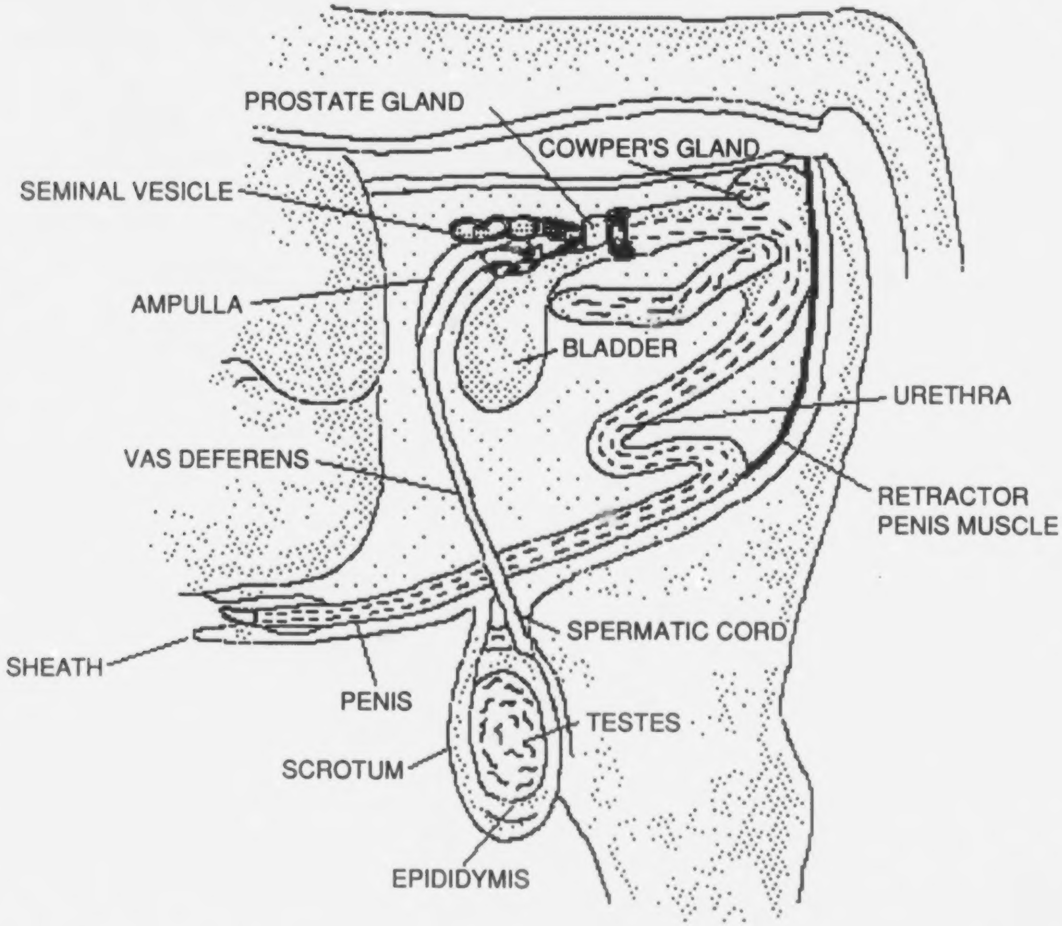
## B. WHAT ARE THE PARTS OF THE MALE REPRODUCTIVE SYSTEM?

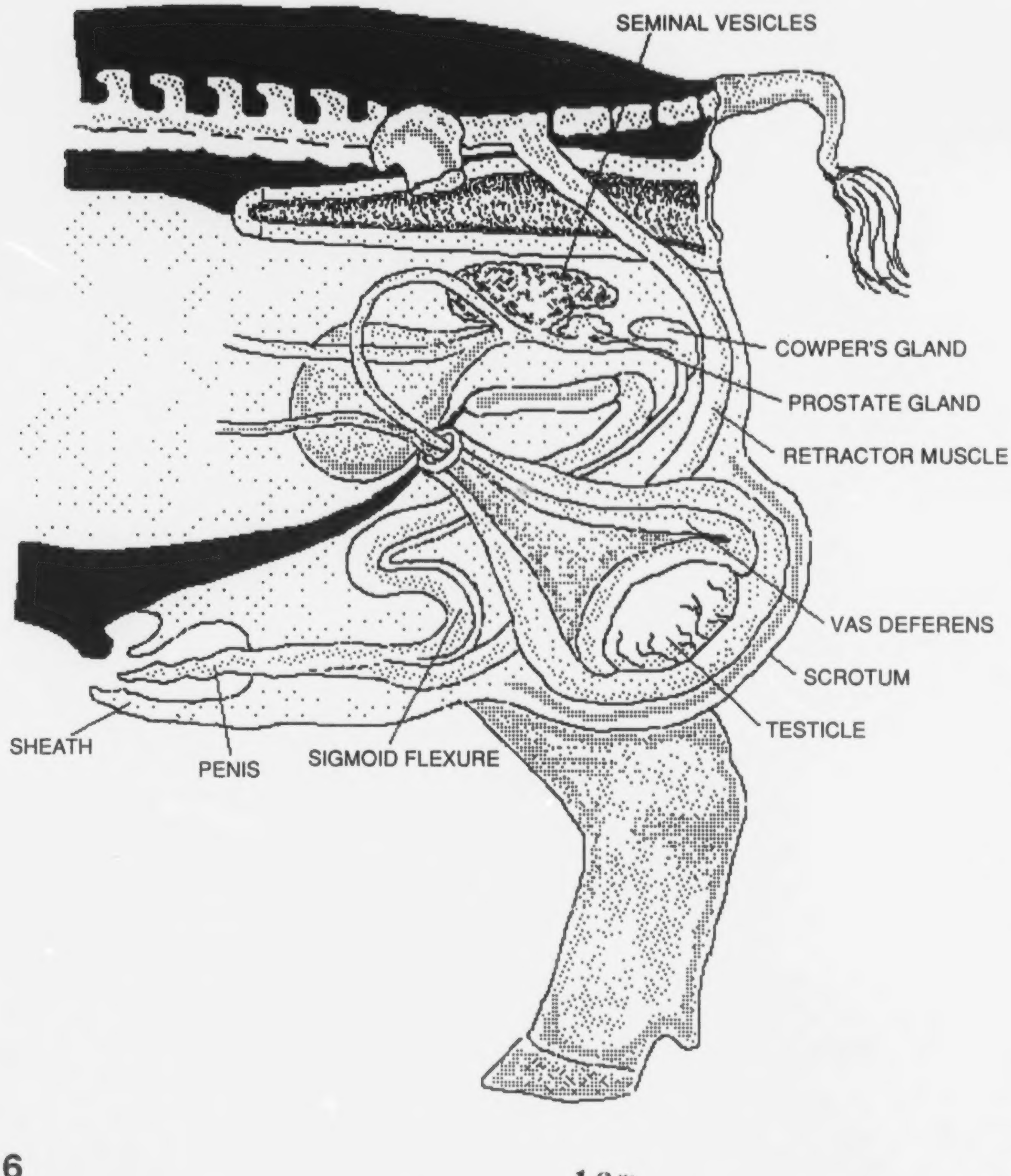
The male reproductive system makes, stores and deposits sperm cells.

All animals have reproductive systems, but they are not all alike.

### REPRODUCTIVE SYSTEM OF A BULL

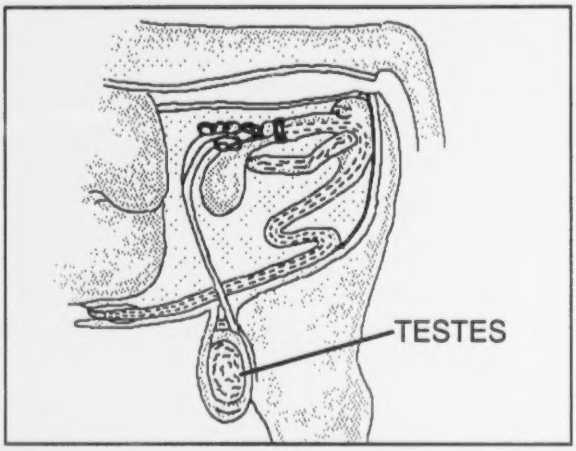

PROSTATE GLAND
COWPER'S GLAND
SEMINAL VESICLE
AMPULLA
BLADDER
URETHRA
VAS DEFERENS
RETRACTOR PENIS MUSCLE
SPERMATIC CORD
SHEATH
PENIS
TESTES
SCROTUM
EPIDIDYMIS

## REPRODUCTIVE SYSTEM OF A BOAR

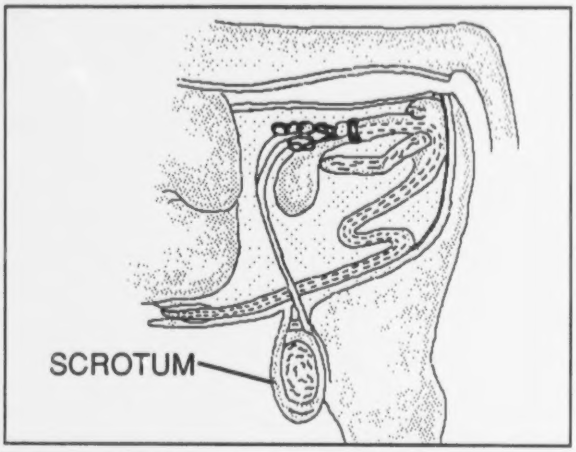

SEMINAL VESICLES
COWPER'S GLAND
PROSTATE GLAND
RETRACTOR MUSCLE
VAS DEFERENS
SCROTUM
TESTICLE
SHEATH
PENIS
SIGMOID FLEXURE

You will be learning the parts of the male reproductive system from the picture of a bull (male cattle). Later you will learn how a boar (male swine) is different.

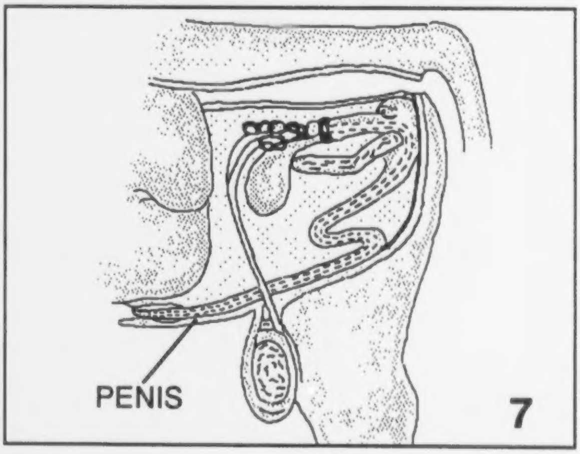
1. **Testes** - testicles is another name for testes. This organ makes sperm cells and the male sex hormone, testosterone.



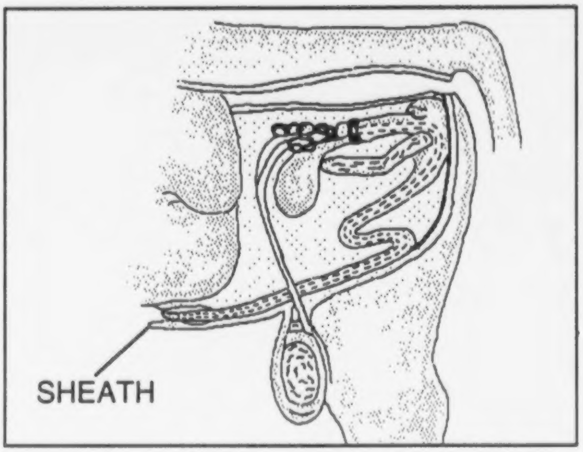
2. **Scrotum** - a sac of skin holding and protecting the testes.



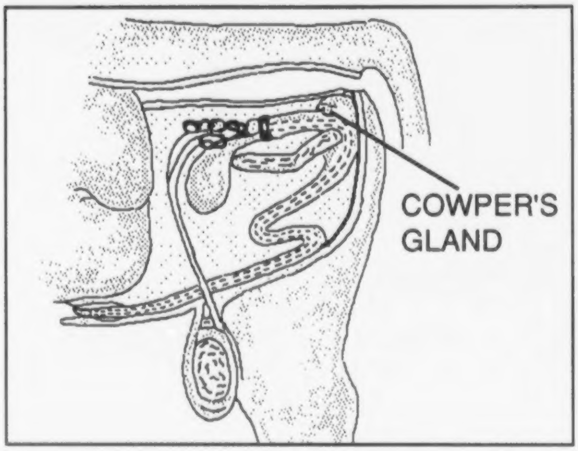
3. **Penis** - male sex organ that places the semen into the female.



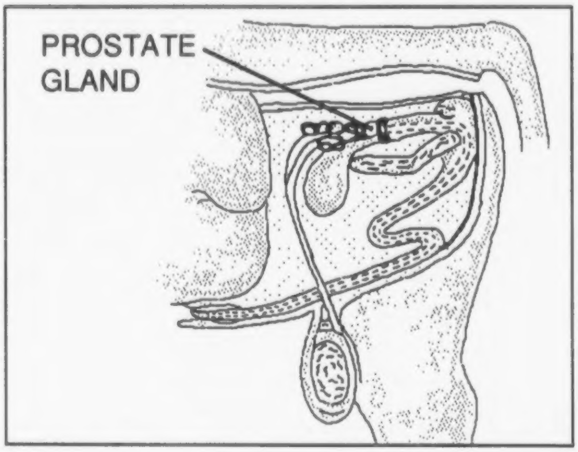
4. **Sheath** - skin covering the penis.



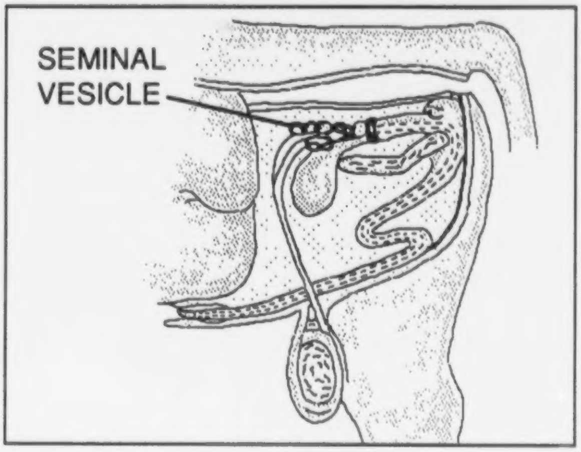
5. **Cowper's gland** - gets the urethra ready for passage of the sperm cells.


COWPER'S GLAND

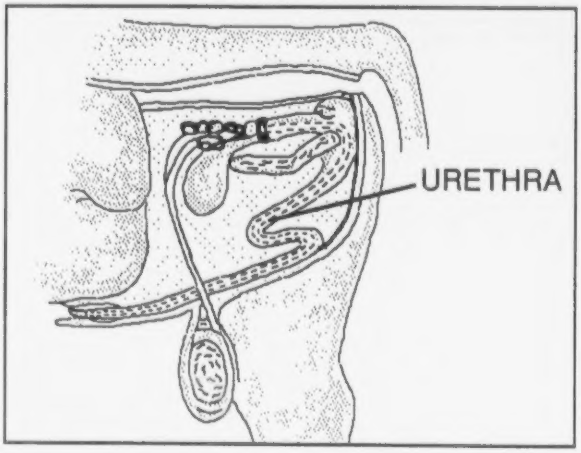
6. **Prostate gland** - gives nutrition to the sperm cells. It is located near the urethra and bladder.


PROSTATE GLAND

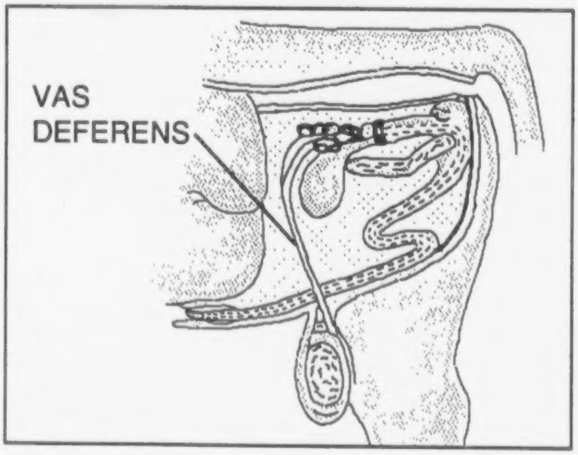
7. **Seminal vesicles** - make and release seminal fluid. The seminal vesicles are connected to the urethra.


SEMINAL VESICLE

8. **Urethra** - passageway for semen. The urethra also carries urine from the bladder.



9. **Vas deferens** - passageway for sperm.


VAS DEFERENS

## DO SKILL SHEET 1

MALE REPRODUCTIVE SYSTEM

# SKILL SHEET 1

Choose the correct term to go with each definition.

____ 1. The male sex organ that places semen into the female

a. scrotum b. testes c. penis

____ 2. This organ gives nutrition to the sperm cells

a. cowper's gland b. prostate gland c. scrotum

____ 3. This organ makes sperm cells and the male hormone

a. testes b. penis c. prostate

____ 4. The skin covering the penis

a. scrotum b. sheath c. urethra

____ 5. The passageway for the sperm

a. vas deferens b. urethra c. testes

____ 6. The passageway for sperm, which also carries urine from the bladder

a. urethra b. seminal vesicles c. scrotum

____ 7. This organ gets the urethra ready for passage of the sperm cells

a. prostate gland b. cowper's gland c. sheath

____ 8. These organs make and release seminal fluid

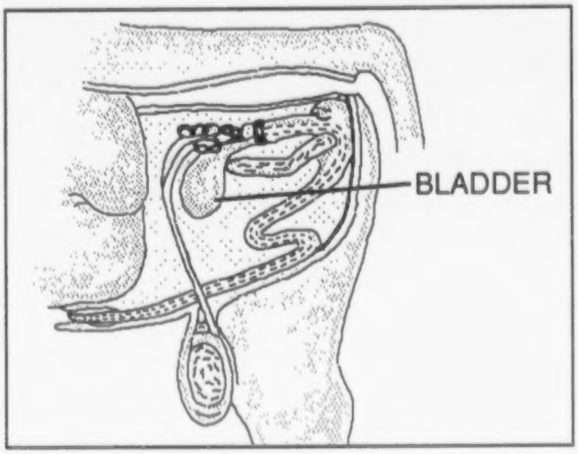
a. vas deferens b. seminal vesicles c. testes

____ 9. A sac of skin holding and protecting the testes

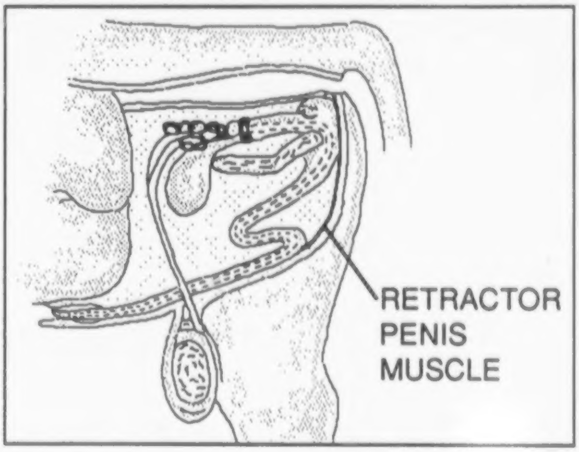
a. sheath b. urethra c. scrotum

## MALE REPRODUCTIVE SYSTEM CONTINUED

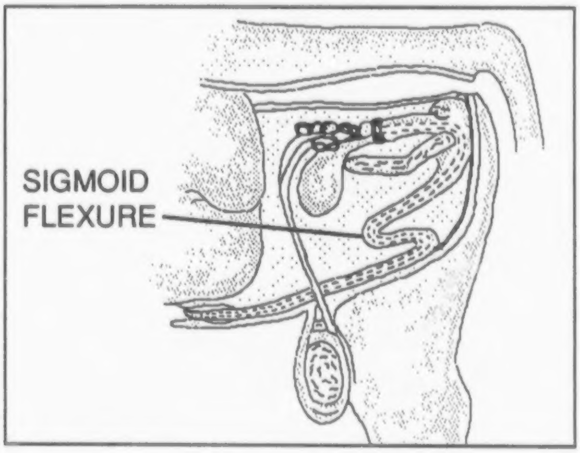
10. **Bladder** - holds the urine after it comes out of the kidneys.



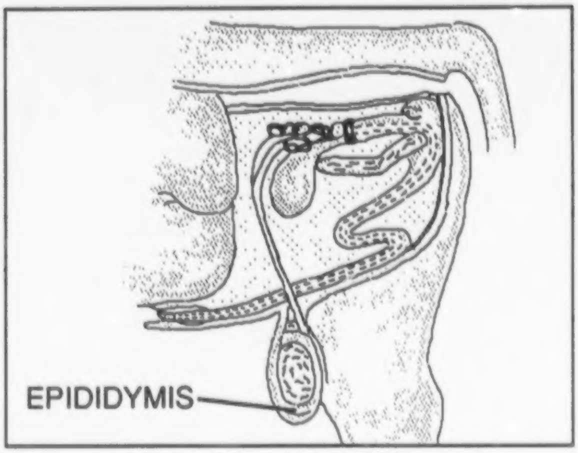
11. **Retractor muscle** - moves the penis backward.


RETRACTOR
PENIS
MUSCLE

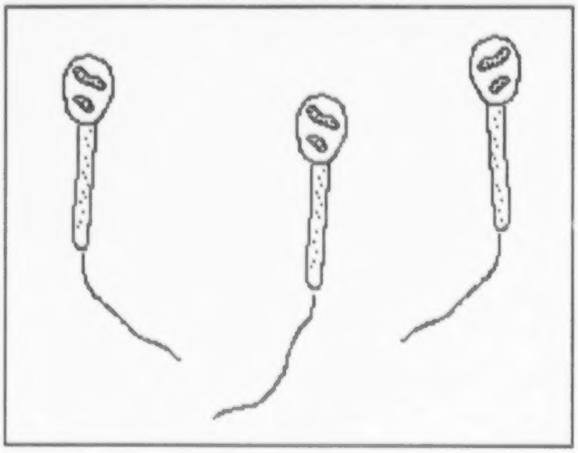
12. **Sigmoid flexure** - moves the penis forward.


SIGMOID
FLEXURE

13. **Epididymis** - a long, coiled tube that stores and transports the sperm cells. The epididymis is connected to each testes.



14. **Sperm cell** - male sex cell



15. **Semen** - mixture of sperm cells and fluids.

16. **Ejaculation** - the process that causes the semen to be passed out, especially for deposit into the female.

**DO SKILL SHEET 2**

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## MALE REPRODUCTIVE SYSTEM

## SKILL SHEET 2

Choose the correct term to go with each definition.

____ 1. The process that causes the release of semen, especially for deposit into the female

a. epididymis b. sperm cell c. ejaculation

____ 2. This organ holds the urine after it comes out of the kidneys

a. sigmoid flexure b. bladder c. ejaculation

____ 3. This organ moves the penis forward

a. sigmoid flexure b. retractor muscle c. bladder

____ 4. This organ moves the penis backward

a. sigmoid flexure b. retractor muscle c. bladder

____ 5. The long, coiled tube that stores and transports sperm cells

a. epididymis b. semen c. sperm cell

____ 6. A mixture of sperm cells and fluids

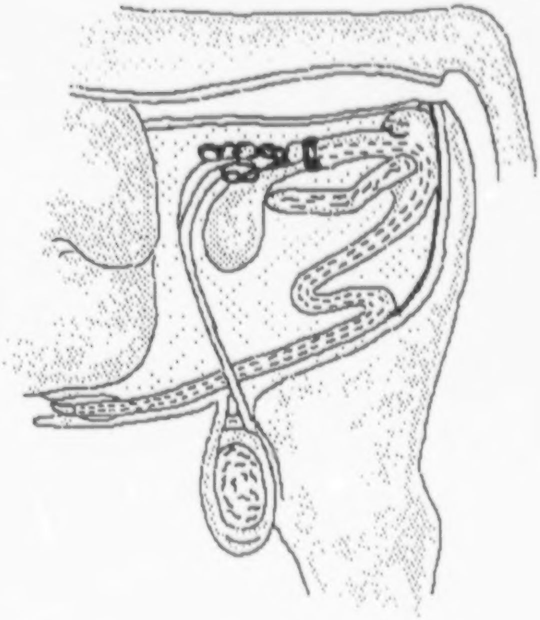
a. epididymis b. semen c. urethra

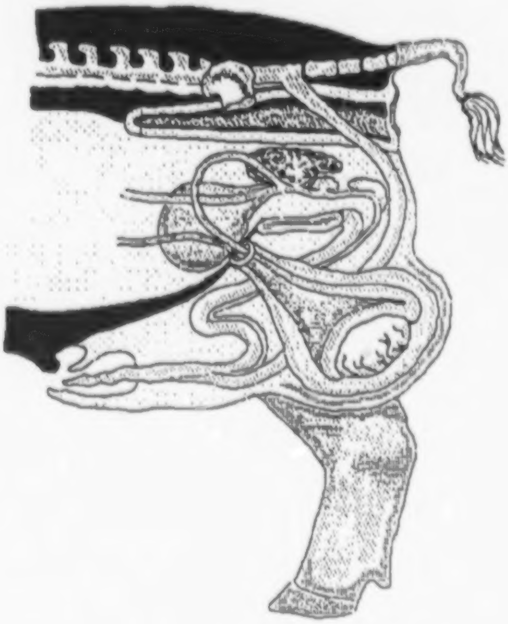
____ 7. Male sex cell

a. ejaculation b. epididymis c. sperm

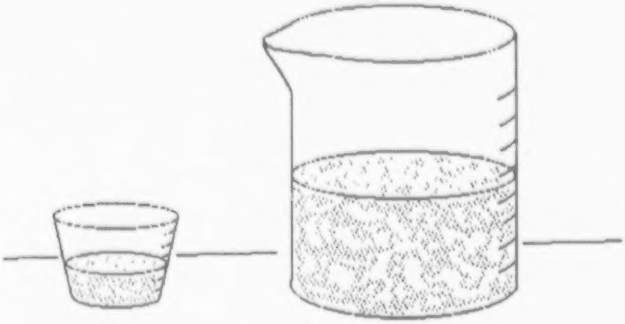
## C. WHAT ARE THE DIFFERENCES BETWEEN THE MALE REPRODUCTIVE SYSTEM OF BULLS AND BOARS?

1. The penis of the bull has a different shape than the penis of a boar.





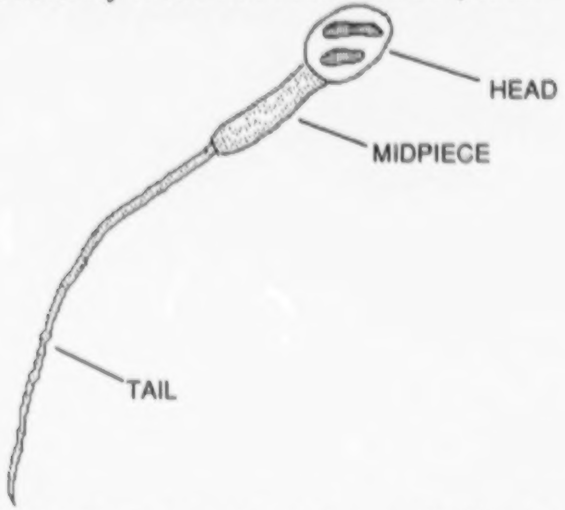
2. The amount of semen and sperm that is ejaculated from the bull is less than that ejaculated from the boar.



**BULL**
5 c.c. semen
4 billion sperm
approximately
per ejaculation

**BOAR**
200 c.c. semen
20 billion sperm
approximately
per ejaculation

3. All sperm basically have the same three parts.



However, bull sperm do not look exactly like boar sperm. You would need a microscope, of course, to see the sperm.

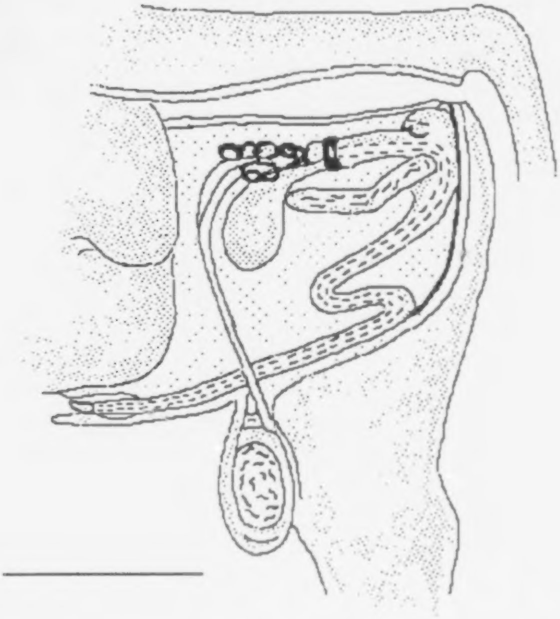
**DO SKILL SHEET 3**

**DO ACTIVITY SHEET 1**

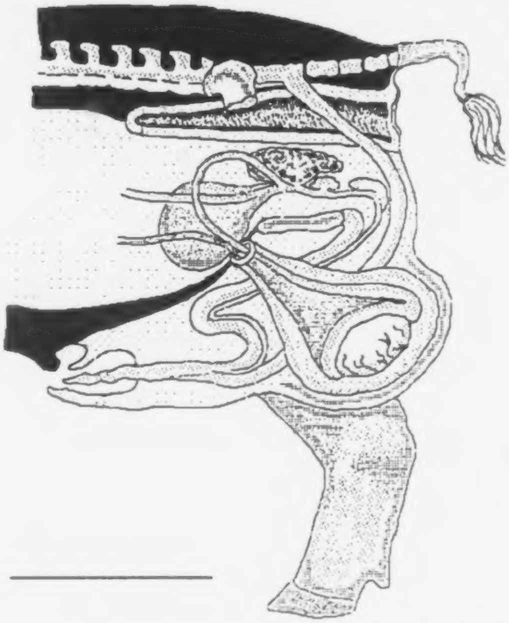
MALE REPRODUCTIVE SYSTEM

## SKILL SHEET 3

1. Label these two drawings bull or boar.



______________



______________

___2. Choose the true statement.

a. A boar ejaculates more sperm than a bull.

b. A bull ejaculates more sperm than a boar.

c. A bull and a boar ejaculate about the same amount of sperm.

MALE REPRODUCTIVE SYSTEM

## ACTIVITY SHEET 1

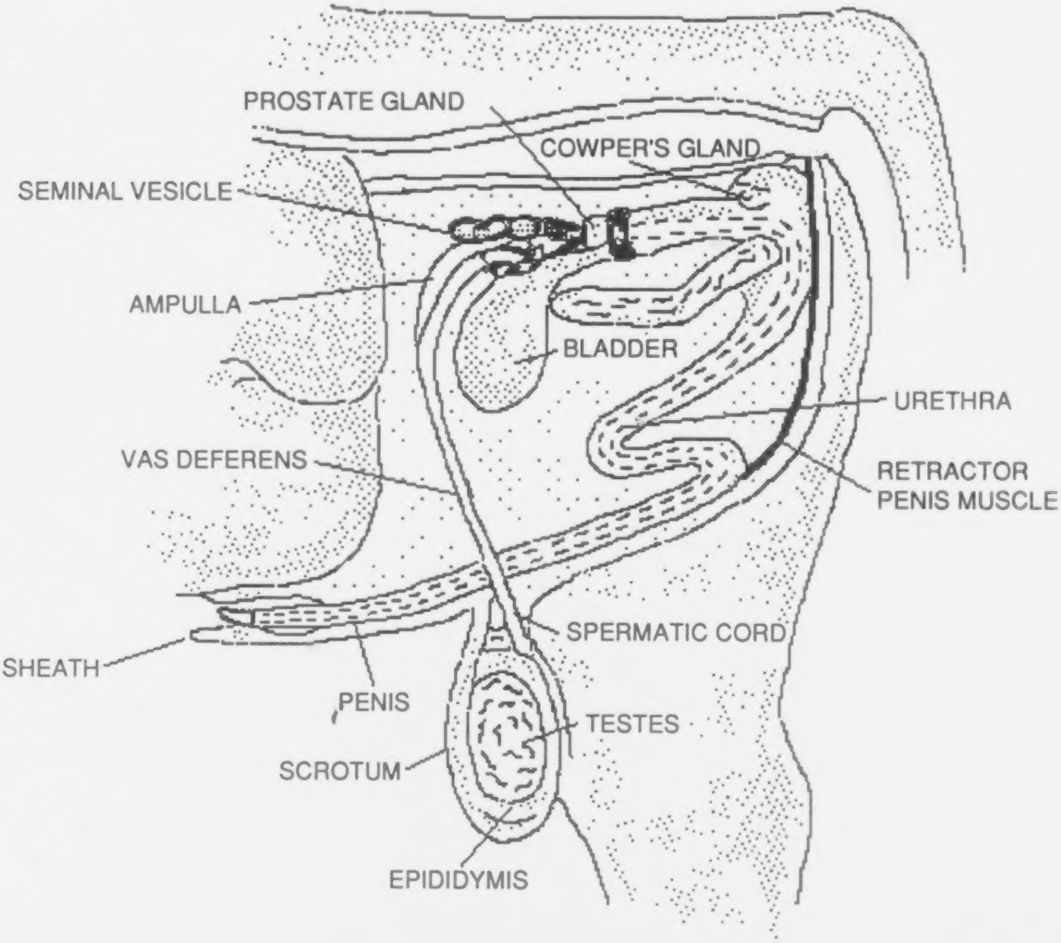
Note to instructor: Obtain actual reproductive system from local packing plant.

Equipment:

- Reproductive system from cattle or swine
- Stick pins
- Small strips of paper to label the parts

Directions: On small strips of paper, make a label for each of the male reproductive parts shown on the pictures. Attach the correct label to the actual reproductive part using stick pins.

## BULL REPRODUCTIVE SYSTEM


PROSTATE GLAND
COWPER'S GLAND
SEMINAL VESICLE
AMPULLA
BLADDER
URETHRA
VAS DEFERENS
RETRACTOR PENIS MUSCLE
SPERMATIC CORD
SHEATH
PENIS
TESTES
SCROTUM
EPIDIDYMIS

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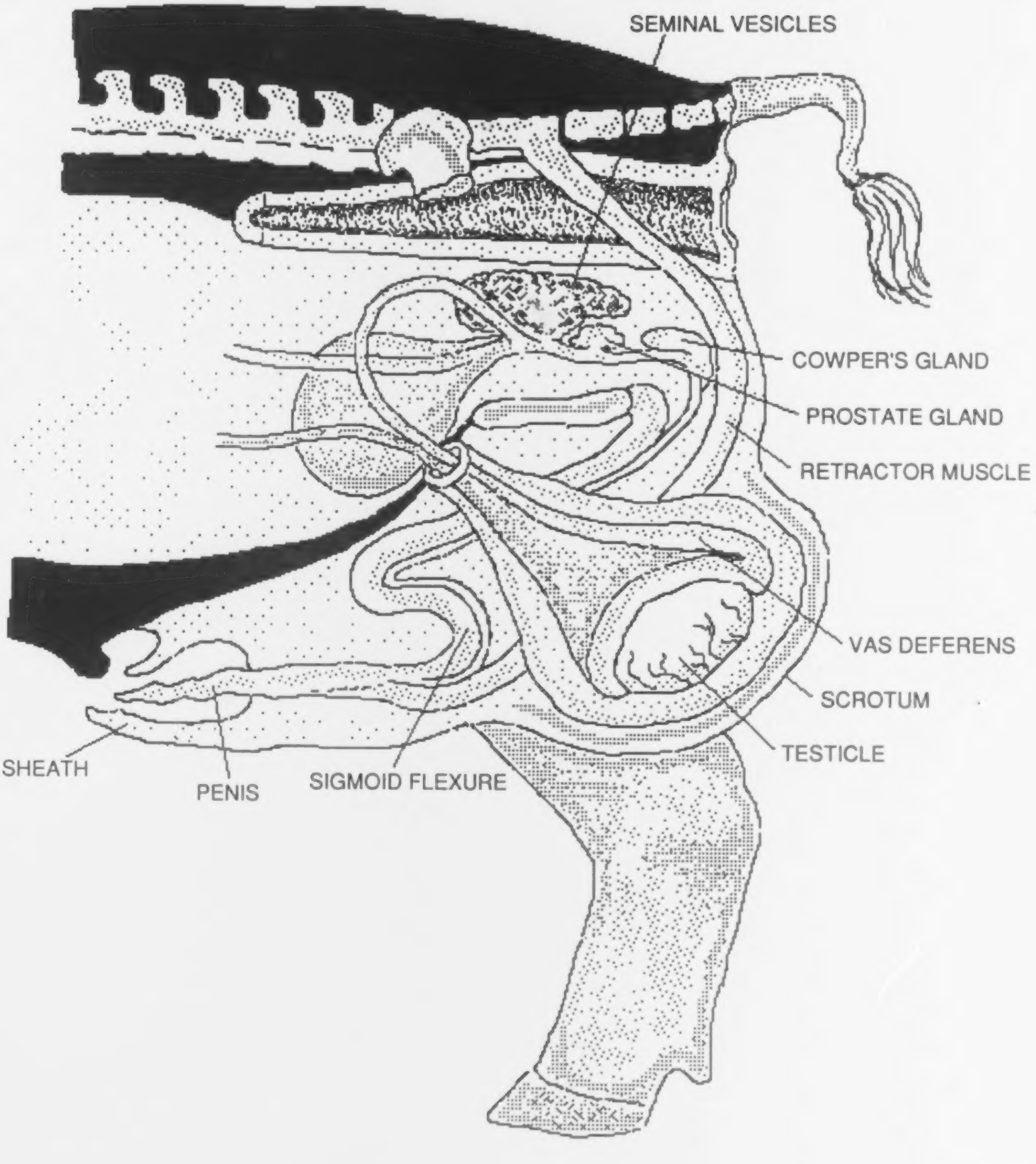
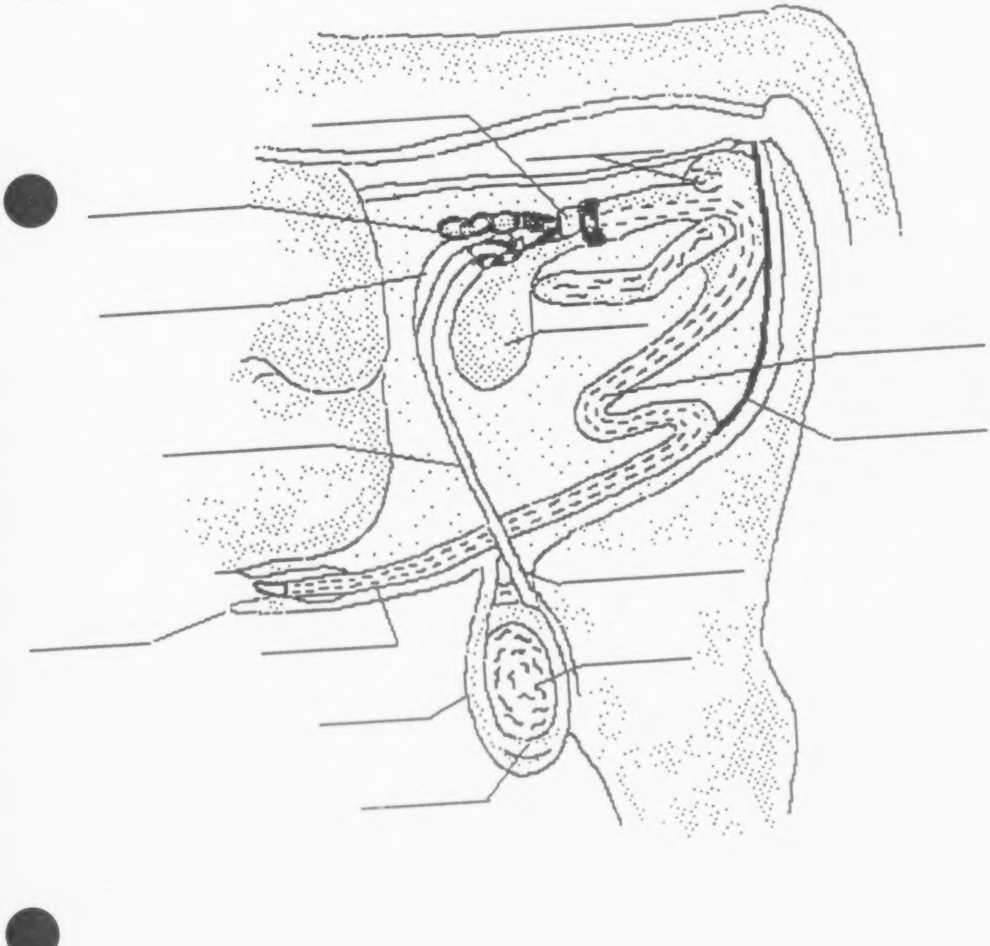
## BOAR REPRODUCTIVE SYSTEM


SEMINAL VESICLES
COWPER'S GLAND
PROSTATE GLAND
RETRACTOR MUSCLE
VAS DEFERENS
SCROTUM
TESTICLE
SHEATH
PENIS
SIGMOID FLEXURE

## MALE REPRODUCTIVE SYSTEM

# UNIT TEST

Part 1. Find the bull's reproductive parts on the diagram below. Use the words on the right to fill in the blanks.



scrotum
penis
urethra
seminal vesicles
testes
Cowper's gland
retractor muscle
Sigmoid flexure
sheath
bladder
vas deferens
prostate gland
epididymis

Part 2. Beside each statement below, put a (T) if it is true and an (F) if it is false.

___14. Semen is made up only of sperm cells.

___15. The prostate gland gets the urethra ready for the passage of sperm cells.

___16. The sheath covers the testes.

___17. The seminal vesicle is connected to the urethra.

___18. The bladder is a gland.

___19. The sigmoid flexure moves the penis backward.

Part 3. Choose the best answer to complete each statement.

___20. The testes make
a. sperm cells.
b. male sex hormone.
c. both A and B.
d. semen.

___21. The scrotum protects the
- a. testes.
- b. penis.
- c. urethra.
- d. bladder.

___22. The Cowper's gland
- a. moves the sperm cells to the urethra.
- b. is the passageway for semen and carries urine.
- c. places the sperm cells into the female.
- d. Gets the urethra ready for the passage of the sperm. cells

___23. The amount of semen produced at one time by a male is the
- a. Sigmoid flexure.
- b. sperm cells.
- c. urethra.
- d. ejaculation.

___24. The long, coiled tube connected to each testes is called the
- a. deferent duct.
- b. epididymis.
- c. vas deferens.
- d. seminal vesicles.

MALE REPRODUCTIVE SYSTEM

# PERFORMANCE CHECKLIST

Student__________________________successfully performed the following tasks:

| TASK | YES | NO | COMMENTS |
|---|---|---|---|
| 1. Identified the parts of the male reproductive system. | | | |
| 2. Identified the function of each part of the male reproductive system. | | | |
| 3. Explained the difference between the reproductive systems of the bull and boar. | | | |

Satisfactory - should move on ☐
Should repeat this unit ☐

____________________
Student's Signature/Date

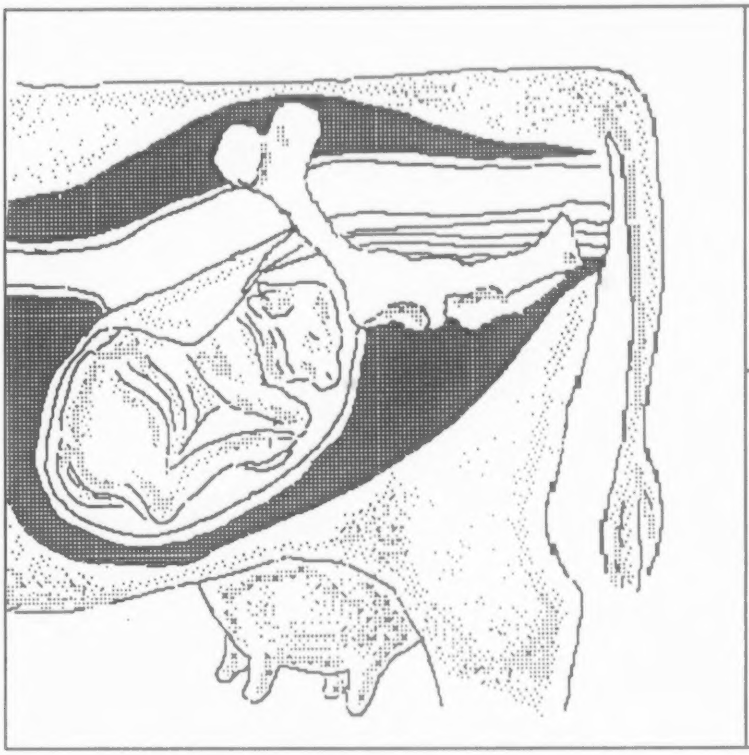
____________________
Instructor's Signature/Date

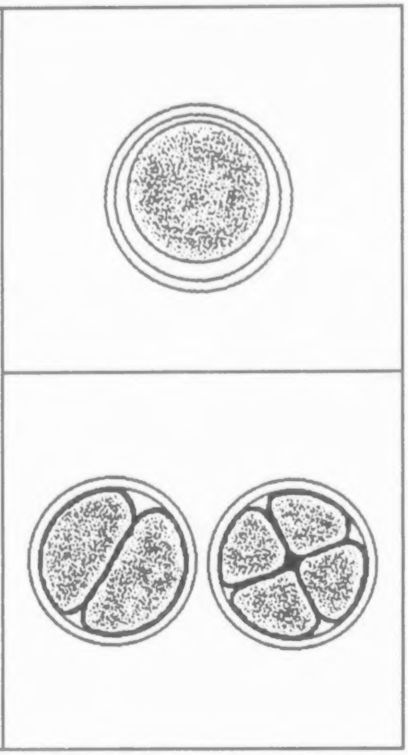
90-1400-S

# Agricultural Science I

## SUPPLEMENTARY UNITS

## Female Reproduction





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# INTRODUCTION

A new animal is created when the female egg is joined by the male sperm. Reproductive organs must be healthy in order for the female to breed successfully and produce strong babies. New animals grow inside the female until they are ready to be born.

# OBJECTIVE

After you complete this unit, you should be able to name the parts of the female reproductive system in cattle and swine and describe the function of each part.

# STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. What are the parts of the female reproductive system?
2. What is the functions of each part?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

## A. TERMS

1. **Bladder** - (blad-der) the sac that holds the urine after it comes out of the kidneys.
2. **Broad ligament** - (brawd, lig-ah-ment) - the ligament that connects to the uterine horns and holds the ovary in swine.
3. **Cervix** - (sir-vex) the neck of the uterus.
4. **Clitoris** - (clit-ore-us) the female sensory organ.
5. **Cotyledons** - (cot-ah-lead-uns) points where the placenta and the uterus connect or attach.
6. **Embryo** - (em-bree-oh) a fertilized egg.
7. **Fallopian tubes** - (full-oh-pean-un, tubes) the place where the egg is fertilized. There are two fallopian tubes and they are also called "oviducts."
8. **Fetus** - (fee-tus) - when the embryo connects to the wall of the uterus, it is then called a fetus. The new animal, before it is born is called the fetus.
9. **Infundibulum** - (in-fun-dib-you-lum) catches the egg and are shaped like funnels.
10. **Litter** - (lit-er) the babies born at one time to an animal that normally bears several young at delivery.

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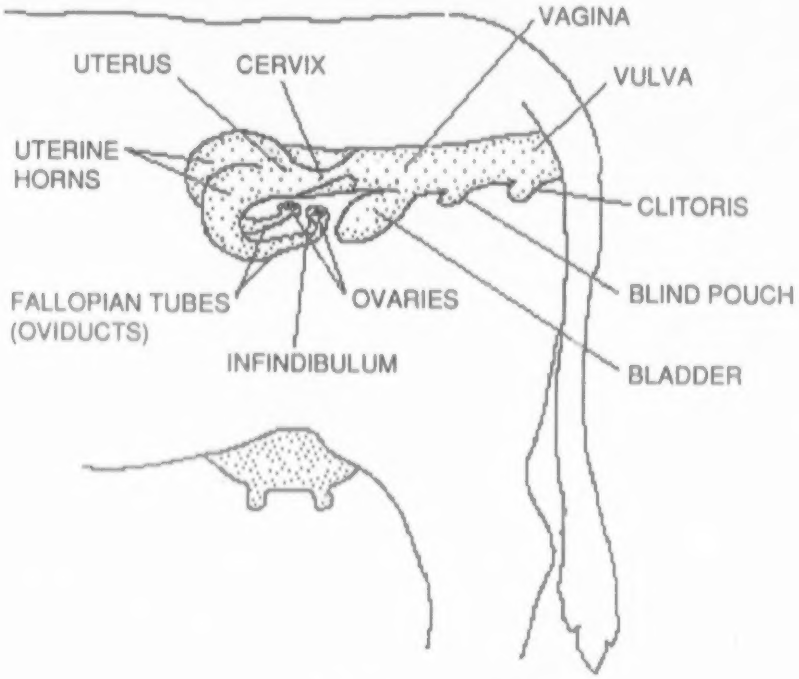
11. **Ovary** - (oh-ver-e) makes the eggs.
12. **Ovulation** - (ov-you-lay-shun) the process of releasing an egg from the ovaries.
13. **Oviducts** - (oh-va-ducks) the place where the egg is fertilized. There are two oviducts, and they are also called fallopian tubes.
14. **Ova** - (oh-vah) female sex cells (more than one egg).
15. **Ovum** - (oh-vum) a female sex cell (one egg).
14. **Placenta** - (plah-sent-ah) a saclike membrane that holds the fetus. The placenta is inside the uterus.
15. **Urethra** - (your-e-thrah) the passageway of urine from the bladder through the vagina.
16. **Uterine horns** - (you-tur-in, horns) where the baby begins to grow.
17. **Uterus** - (you-tur-us) also called the womb. It has two horns or branches. The baby grows in the uterus.
18. **Vagina** - (vah-gy-nah) a passageway for the sperm cells and also for birth. It is between the cervix and vulva.
19. **Vulva** - (vull-vah) the outside opening of the reproductive and urinary systems.

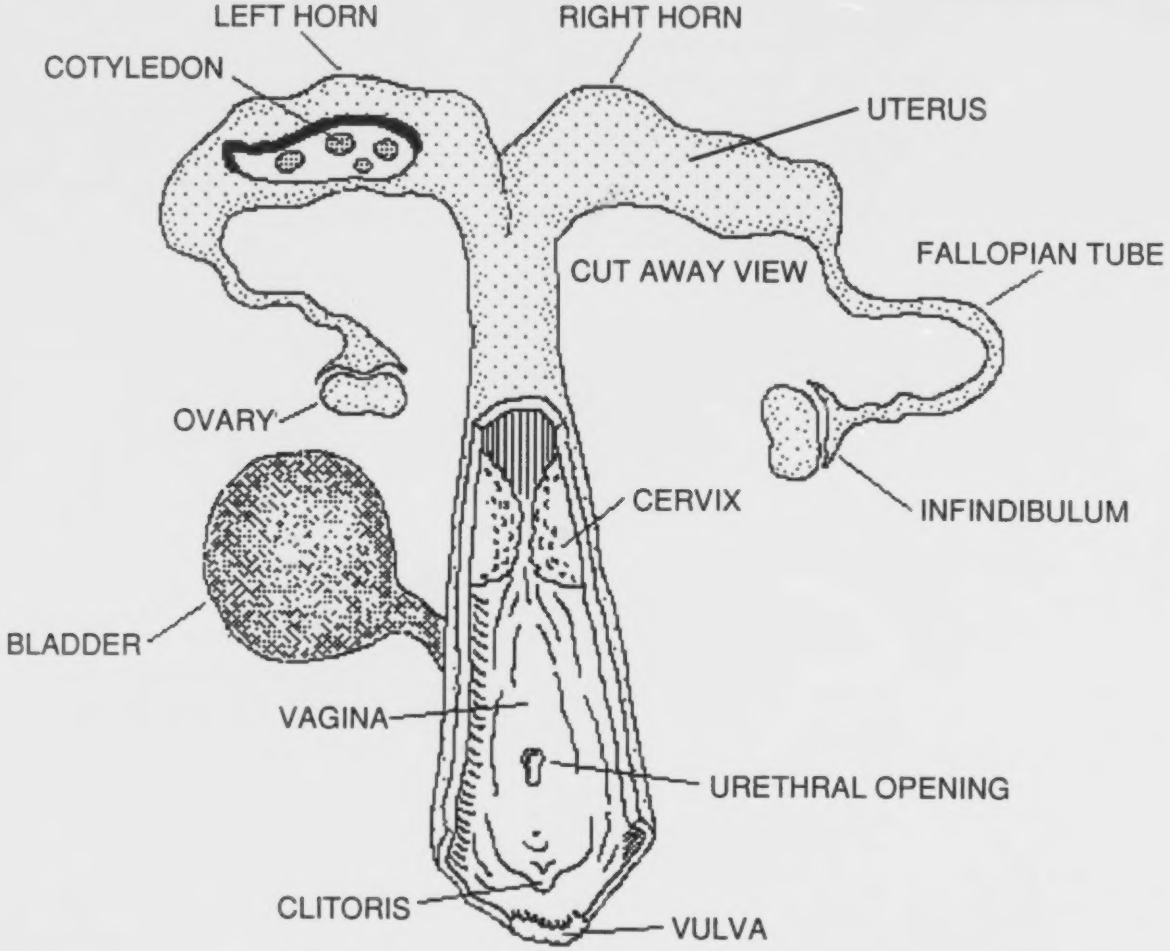
## B. WHAT ARE THE PARTS OF THE FEMALE REPRODUCTIVE SYSTEM?

The female reproductive system makes the eggs. After the egg is fertilized by the male sperm, the new animal or fetus grows inside the female. This is true if the animal is a mammal. In poultry, of course, the baby grows inside the egg. Female swine are litter-bearing animals, or have several babies at once. Female cattle are not litter bearing. Although cows sometimes have twins, usually they produce only one calf at a time.

### REPRODUCTIVE SYSTEM OF A COW (SIDE VIEW)

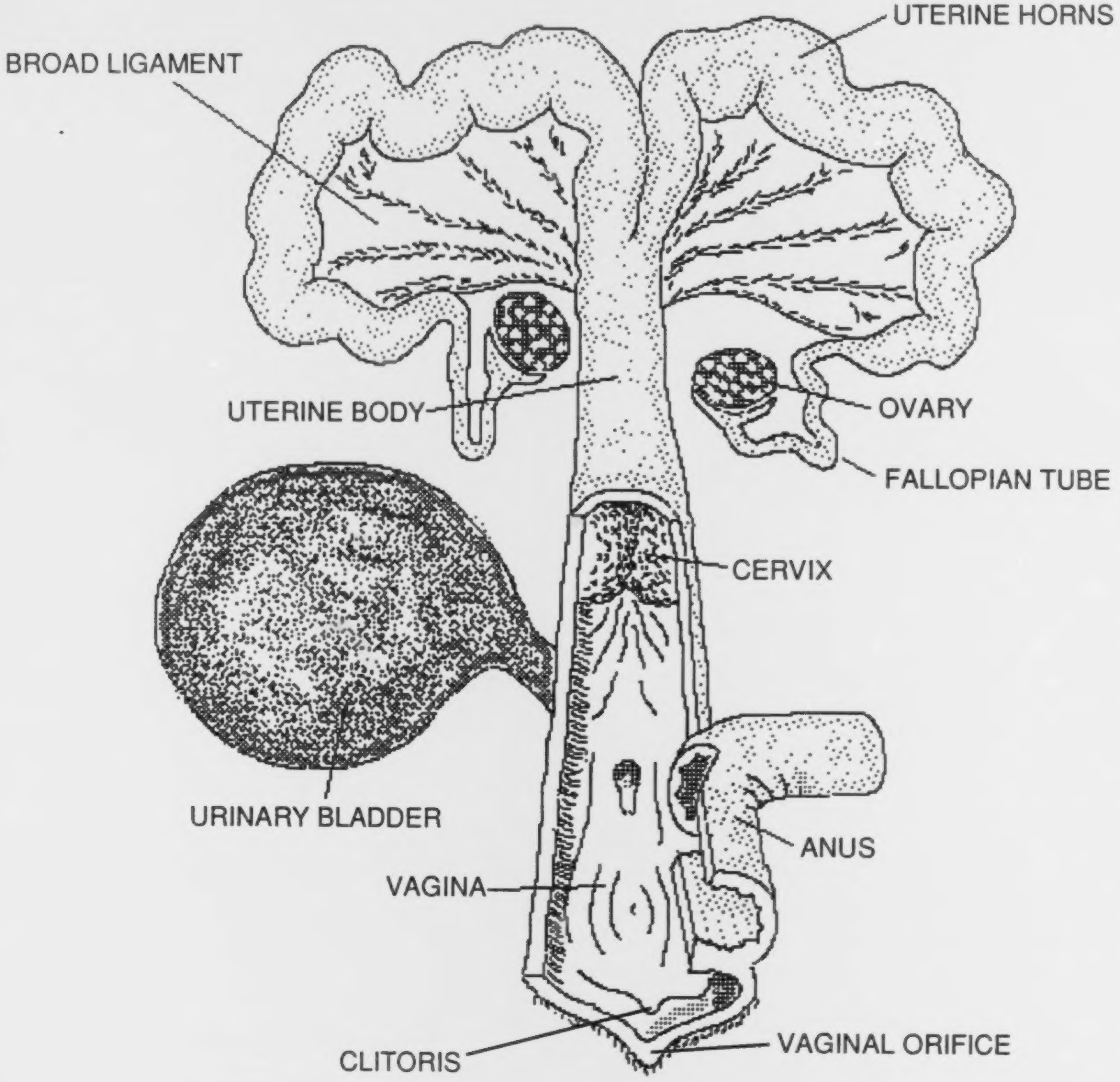

VAGINA
UTERUS
CERVIX
VULVA
UTERINE HORNS
CLITORIS
BLIND POUCH
FALLOPIAN TUBES (OVIDUCTS)
OVARIES
INFINDIBULUM
BLADDER

## REPRODUCTIVE SYSTEM OF A COW (TOP VIEW)


LEFT HORN
RIGHT HORN
COTYLEDON
UTERUS
CUT AWAY VIEW
FALLOPIAN TUBE
OVARY
INFINDIBULUM
CERVIX
BLADDER
VAGINA
URETHRAL OPENING
CLITORIS
VULVA

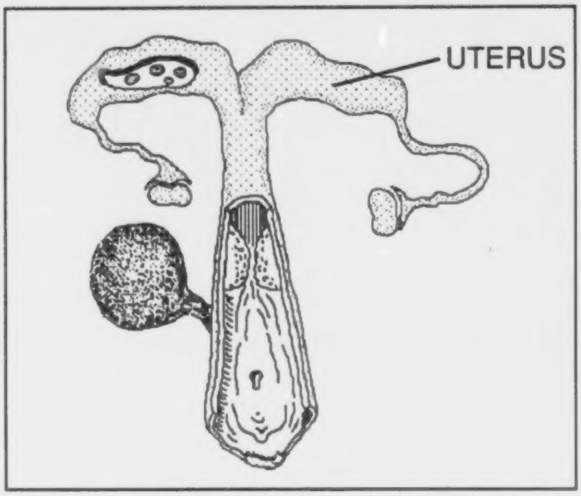
193

## REPRODUCTIVE SYSTEM OF A SOW (TOP VIEW)

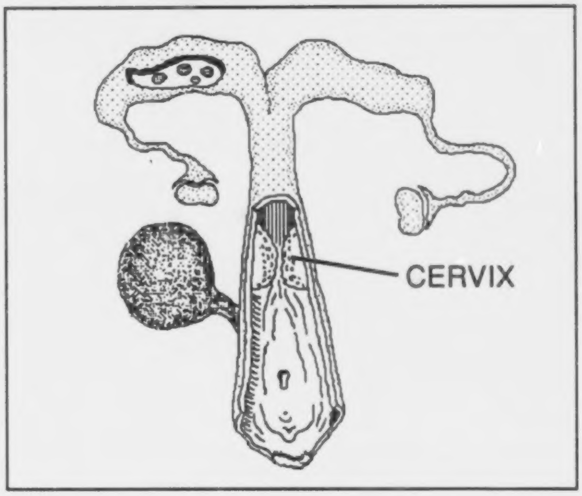

UTERINE HORNS
BROAD LIGAMENT
UTERINE BODY
OVARY
FALLOPIAN TUBE
CERVIX
URINARY BLADDER
ANUS
VAGINA
CLITORIS
VAGINAL ORIFICE

194

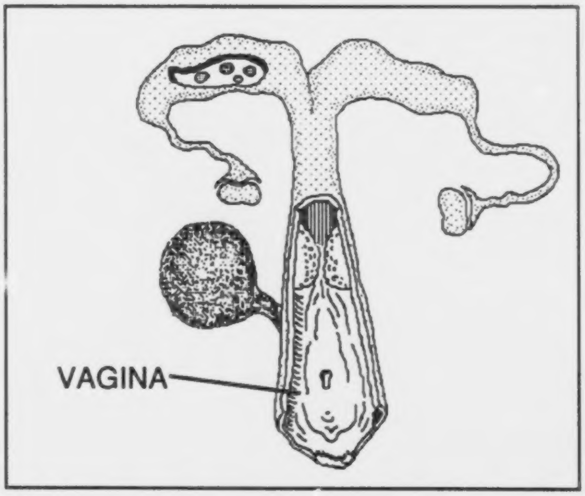
1. **Uterus** - is also called the womb. It has two horns or branches. The baby grows inside the uterus.



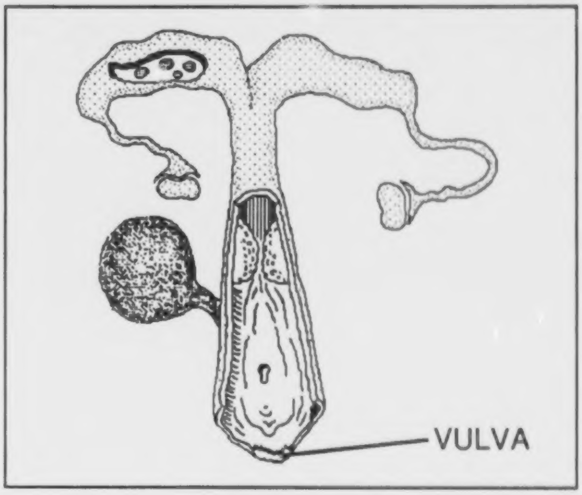
2. **Cervix** - the neck of the uterus.



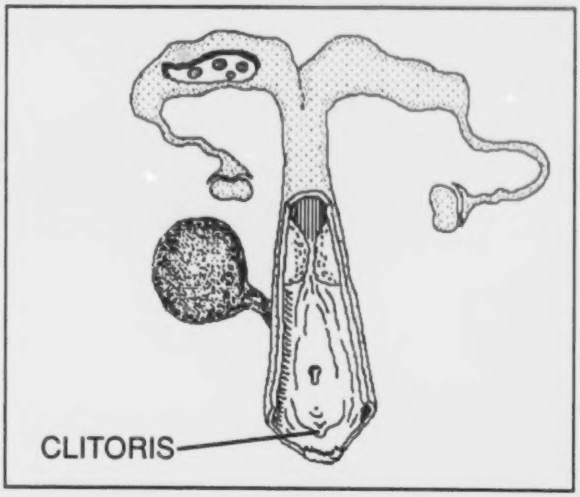
3. **Vagina** - a passageway for the sperm cells. It is between the cervix and vulva.



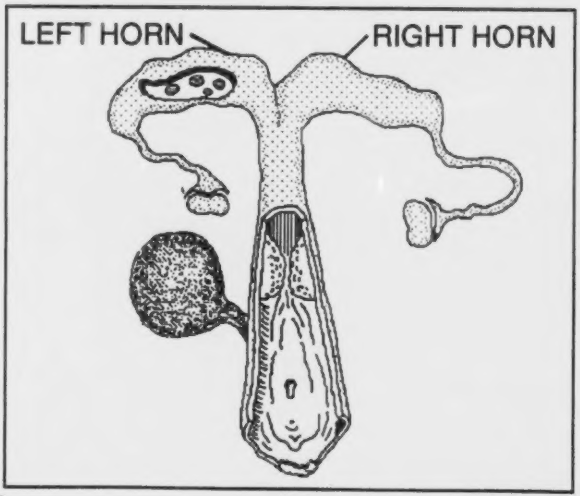
4. **Vulva** - the outside opening of the reproductive and urinary systems.



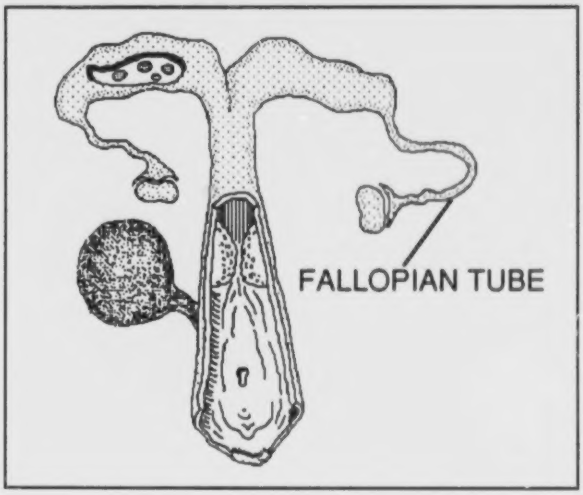
5. **Clitoris** - the female sensory organ.



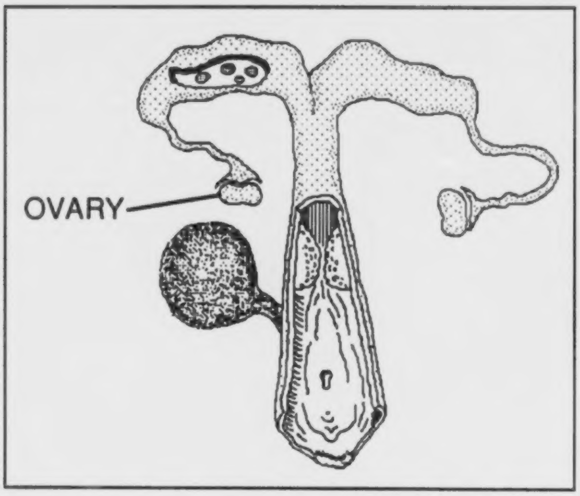
6. **Uterine horns** - where the fetus or baby begins to grow.


LEFT HORN
RIGHT HORN

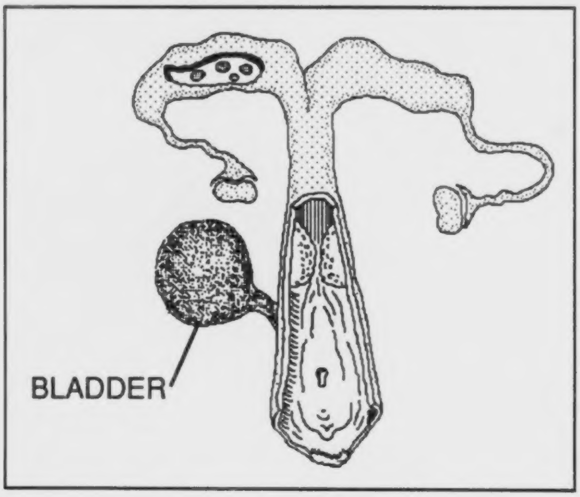
7. **Fallopian tubes** - the place where the ovum or egg is fertilized. There are two fallopian tubes or oviducts.



8. **Ovary** - the eggs are made in the ovaries. Both cattle and swine have two ovaries that are connected to the fallopian tubes.



9. **Bladder** - the sac that holds the urine after it comes out of the kidneys.



## DO SKILL SHEET 1

FEMALE REPRODUCTIVE SYSTEM

## SKILL SHEET 1

Choose the correct term to match each definition

____ 1. The sac that holds the urine after it comes out of the kidneys

a. bladder b. urethra c. ovary

____ 2. The womb where the baby grows

a. clitoris b. vagina c. uterus

____ 3. The female sensory organ

a. vulva b. vagina c. clitoris

____ 4. Where the fetus or baby begins to grow

a. vulva b. uterine horns c. cervix

____ 5. The neck of the uterus

a. clitoris b. cervix c. bladder

____ 6. A passageway for the sperm cells between the cervix and vulva

a. vagina b. uterine horns c. cervix

____ 7. The outside opening of the reproductive and urinary systems

a. ovary b. vulva c. clitoris

____ 8. The female organs that makes the eggs

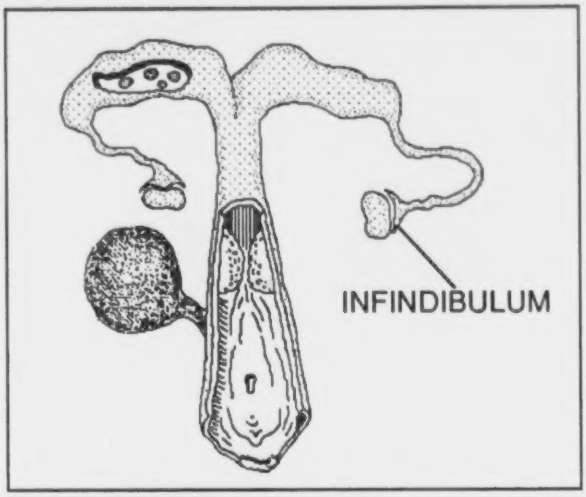
a. bladder b. vagina c. ovaries

____ 9. The place where the ovum or egg is fertilized

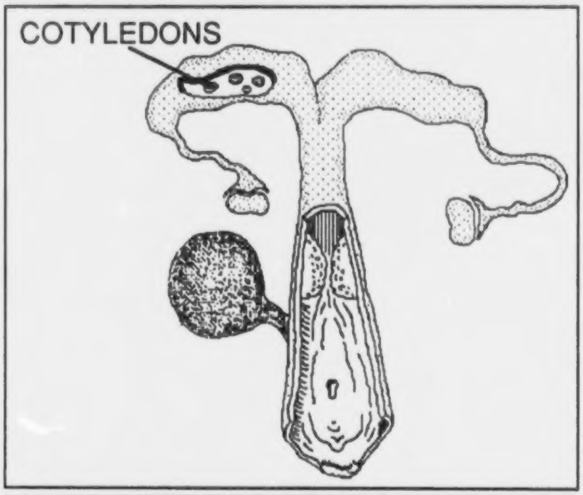
a. fallopian tubes b. ovary c. vulva

## PARTS OF THE FEMALE REPRODUCTIVE SYSTEM CONTINUED

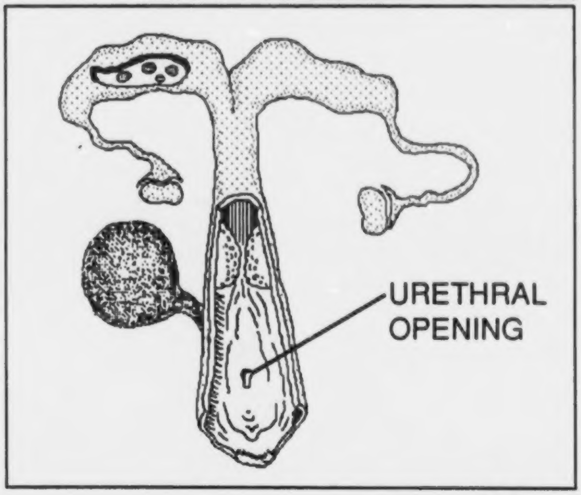
10. **Infundibulum** - catches the egg. They are shaped like funnels.


INFINDIBULUM

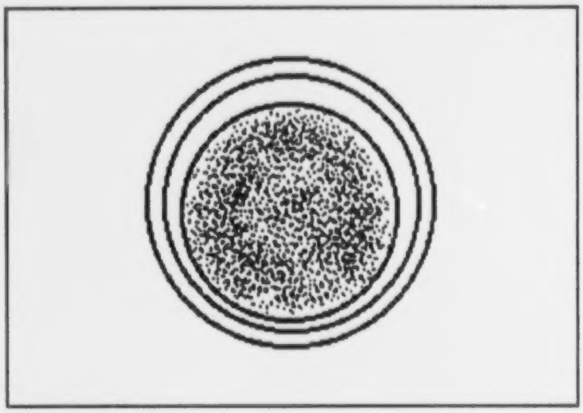
11. **Cotyledons** - points where the placenta and the uterus connect or attach. They look like buttons.


COTYLEDONS

12. **Urethra** - the passageway of urine through the vagina.

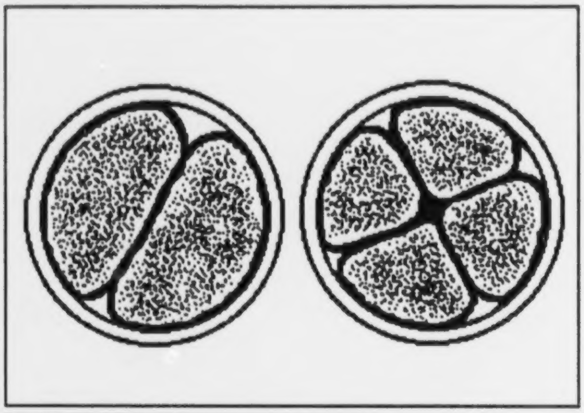

URETHRAL
OPENING

13. **Ovum** - a female sex cell or egg. Ova is more than one sex cell or two or more eggs.

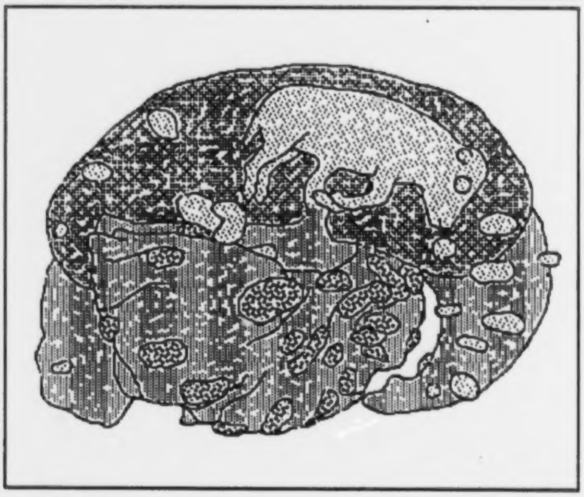


14. **Ovulation** - the process of releasing an egg or eggs from the ovaries.

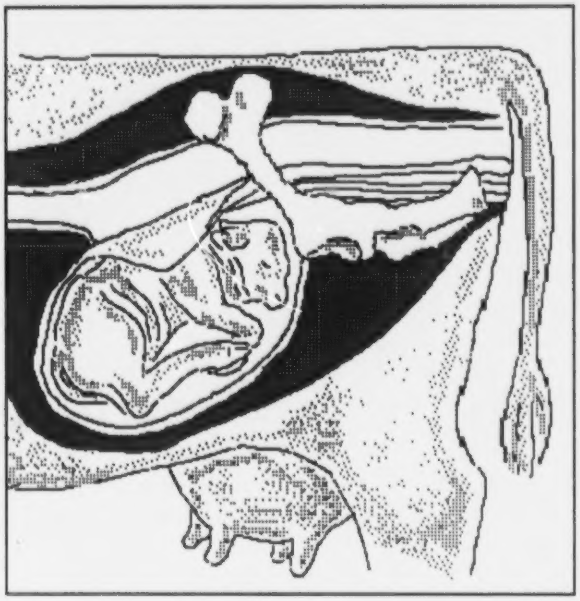
15. **Embryo** - a fertilized egg.



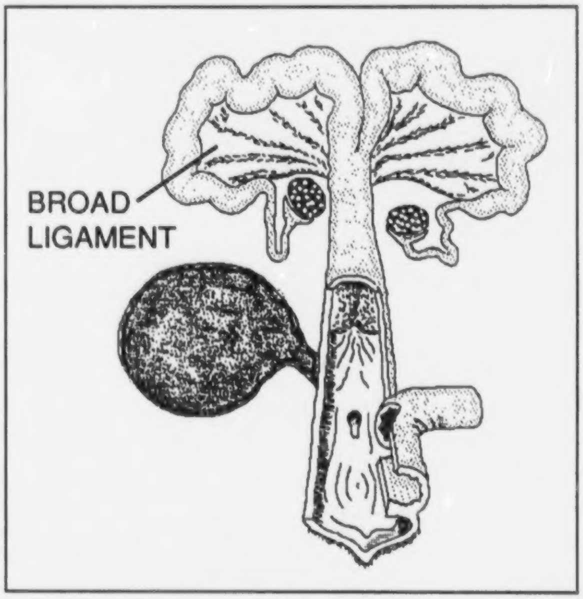
16. **Placenta** - a saclike membrane that the fetus is inside the uterus.



17. **Fetus** - when the embryo connects to the wall of the uterus, it is then called a fetus. The new animal, before it is born, is called the fetus.



18. **Broad ligament** - the ligament that connects to the uterine horns and holds the ovary in swine.



**DO SKILL SHEET 2**

FEMALE REPRODUCTIVE SYSTEM

## SKILL SHEET 2

Choose the term that correctly matches each definition.

____ 1. The passageway of urine through the vagina

a. infundibulum b. urethra c. fetus

____ 2. The organ that connects to the uterine horns and holds the ovary in swine

a. broad Ligament b. embryo c. infundibulum

____ 3. An embryo than has connected to the wall of the uterus and is growing there

a. fetus b. ovum c. placenta

____ 4. A saclike membrane that holds the fetus inside the uterus

a. ova b. embryo c. placenta

____ 5. The process of releasing an egg or eggs from the ovaries

a. ovum b. ovulation c. ova

____ 6. One female sex cell or egg

a. ovum b. ovulation c. ova

____ 7. These funnel-shaped organs catch the egg

a. urethra b. infundibulum c. cotyledons

____ 8. The button-like points where the placenta and the uterus connect or attache

A. urethra b. infundibulum c. cotyledons

____ 9. A fertilized egg

a. embryo b. placenta c. ovum

## FEMALE REPRODUCTIVE SYSTEM

# ACTIVITY SHEET 1

Note to Instructor: Obtain actual reproductive system from local packing plant.

Equipment:

reproductive system from cattle or swine
stick pins
small strips of paper to label the parts

Directions: Use stick pins and paper strips to label each organ. Use the pictures on pages 6 or 7 and the words below to help identify each part:

a. fallopian tubes
b. vulva
c. cotyledons
d. uterus
e. bladder
f. cervix.
g. broad ligament (swine)
h. infundibulum
i. urethra
j. clitoris
k. ovary
l. uterine horns
m. vagina

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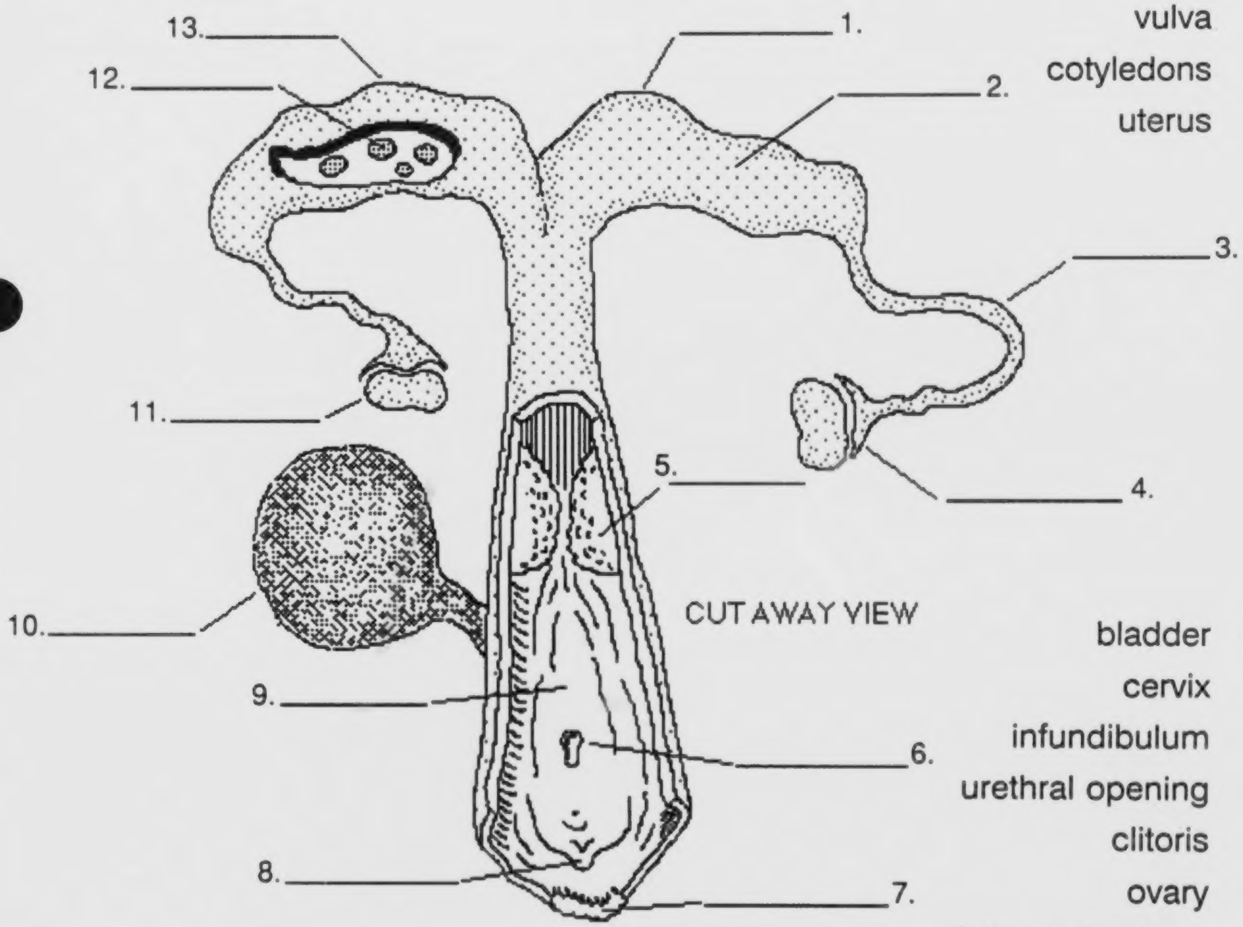
## FEMALE REPRODUCTIVE SYSTEM

# UNIT TEST

Directions: Find the reproductive parts of a cow on the diagram below. Use the words on the right to fill in the blanks.

fallopian tubes
vulva
cotyledons
uterus



bladder
cervix
infundibulum
urethral opening
clitoris
ovary
right uterine horn
left uterine horn
vagina

Place a "T" beside each true statement; place an "F" beside each false statement.

____ 14. Ova is one sex cell or egg.

____ 15. Ovulation is the process of releasing an egg form the ovaries.

____ 16. The broad ligament connects to the uterine horns and holds the ovaries.

____ 17. When the fetus connects to the wall of the uterus, it is called an embryo.

____ 18. The bladder is a gland.

____ 19. The infundibulum is shaped like a sack.

____ 20. The fetus grows inside the vagina.

Place the letter of the word or words that best complete each statement or answers each question on the blank at the left.

___21. A fertilized egg is called the?
a. fetus
b. embryo
c. ova
d. ovum

___22. The membrane that surrounds the fetus is the?
a. cotyledon
b. infundibulum
c. placenta
d. broad ligament

___23. The neck of the uterus is called the?

a. clitoris　　b. vagina
c. cervix　　d. urethra

___24. The eggs are made in the?

a. ovary　　b. uterine horns
c. fallopian tubes　　d. uterus

___25. What organ catches the eggs?

a. cotyledons　　b. uterine horns
c. clitoris　　d. infundibulum

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FEMALE REPRODUCTIVE SYSTEM

# PERFORMANCE CHECKLIST

Student ______________________ successfully performed the following tasks:

| TASK | YES | NO | COMMENT |
|---|---|---|---|
| 1. Identified parts of the female reproductive system. | | | |
| 2, Matched parts of the female reproductive system with their functions. | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

______________________
Student's Signature/Date

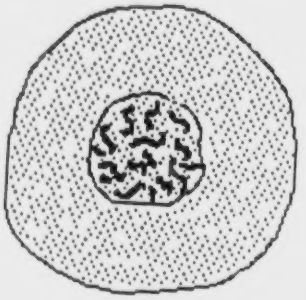
______________________
Instructor's Signature/Date

90-1400-S

# Agricultural Science I

SUPPLEMENTARY UNITS

## Heritability



**Male Gametes**

**Female Gametes**

| | P | P |
|---|---|---|
| P | PP | PP |
| P | PP | PP |

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# INTRODUCTION

Animals and people are alike in some ways. They both inherit or get certain features from their parents. Tiny molecules called genes pass these inherited traits from parent to child. In livestock, we call this inheritance through the genes heritability.

# OBJECTIVE

After you complete this unit, you should be able to describe the heritability of traits in animals.

# STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. What is heritability?
2. How are traits inherited?
3. What are dominant and recessive traits?
4. What are heterozygous and homozygous genes?
5. How is the sex of the unborn animal determined?
6. What are complete dominance and incomplete dominance?

7. What is the checkerboard or "Punnett" Square?

8. What are phenotypes and genotypes?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

## A. TERMS

1. **Heritability** - (hair-it-ah-bill-it-tea) is the difference between animals that is passed from the parents to the young.
2. **Chromosomes** - (crow-mah-zoms) rod-shaped bodies inside the nucleus of a cell. One chromosome comes from the father, and one chromosome comes from the mother. Chromosomes come in pairs.
3. **Gamete** - (gam-eat) a reproductive cell (sperm or egg) that is mature and capable of joining with another gamete to form a new embryo.
4. **Genes** - (jeans) animal traits are controlled by genes. Genes are tiny molecules found on chromosomes. Every animal has thousands of genes. Genes come in pairs.
5. **Genetics** - (ja-net-iks) the study of heredity, or the way in which traits of parents are passed to their offspring.
6. **Genotype** - (jean-o-type) the structure of the gene pair.
7. **Dominant** - (dah-min-ent) a dominant gene (in a pair) is stronger or hides the effect of the other gene.
8. **Recessive** - (re-cess-ive) a recessive gene (in a pair) is hidden by the dominant gene.
9. **Heterozygous** - (heh-ter-oh-zy-gus) a heterozygous gene pair, each of the two genes carry a different pattern. For example one gene is for a polled (hornless) cow, the other is for a horned cow.

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10. **Homozygous** - (ho-mo-zy-gus) a homozygous gene pair carries two genes that are alike for a trait. Both genes present are for the polled or hornless trait, for example.

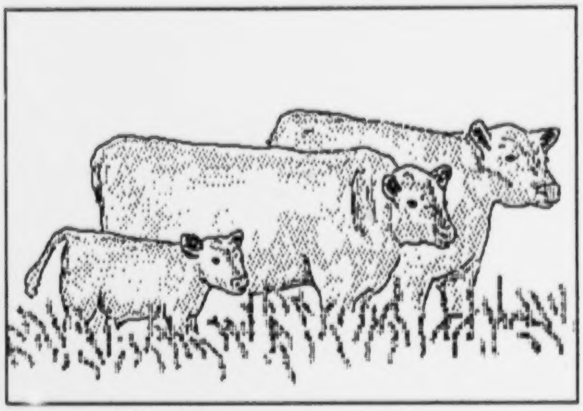
11. **Incomplete dominance** - (in-come-pleat, dah-min-none-z) takes place when one gene does not hide the effect of the other gene in a pair.

12. **"Punnett" square** - (Pun-nit) another name for the checkerboard that is used to predict the results of crossing animals with different traits.

13. **Phenotype** - (fen-oh-type) refers to the physical appearance of the animal.

14. **Traits** - (traytz) specific physical qualities or characteristics.

## B. WHAT IS HERITABILITY?

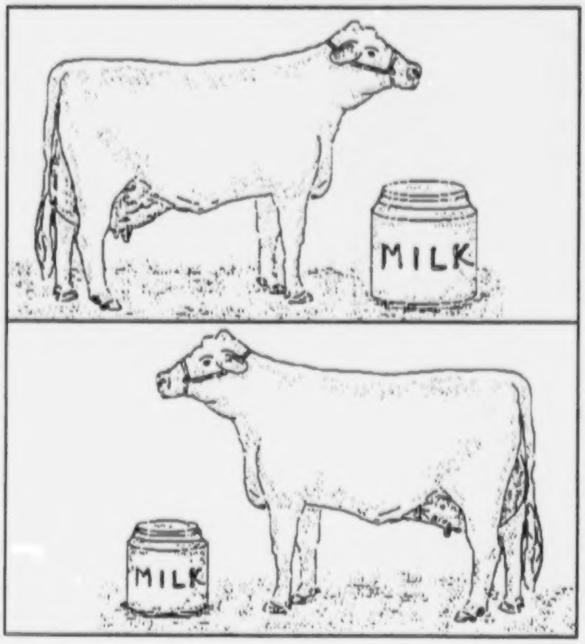


**Heredity** is the way certain traits are passed from parents to their offspring. For example, cattle come in many different colors. A calf inherits certain colors from its parents. We call the study of heredity **genetics.**

Not all differences in animals are caused by **heredity**. The conditions under which animals are raised also affect how they will grow and develop.

**Heritability** is a scientific term that means the amount of the difference between animals that is passed from the parents to the young. Being horned or polled (no horns) is a **heritable trait**.

Differences in animals can be very important to the owner. For example, dairy cows are bred to improve milk-producing **traits**. A dairy operator would not want the babies of a cow that gave little milk. Those babies might grow into poor milkers like their mother.



Some **traits** have a better chance of being inherited than others. It often takes several generations before the **trait** being developed becomes strong or **dominant**.

Understanding **heritability** helps breeders improve the quality of their animals. It helps them choose which males and females to breed together.

## DO SKILL SHEET 1

## HERITABILITY

# SKILL SHEET 1

Part 1. Choose the best answer to complete each statement.

___ 1. Genetics is

a. the study of animal husbandry

b. the study of heredity

c. the study of cattle breeding

___ 2. Heritability is

a. the ability to breed and make young.

b. an evaluation of an animal's health.

c. the differences between animals passed from parents to young.

___ 3. Understanding heritability helps breeders

a. produce better animals.

b. choose which male and female animals to breed together.

c. both A and B

___ 4. Using information about heritability in a breeding program can be

a. very important.

b. extremely expensive.

c. a waste of time.

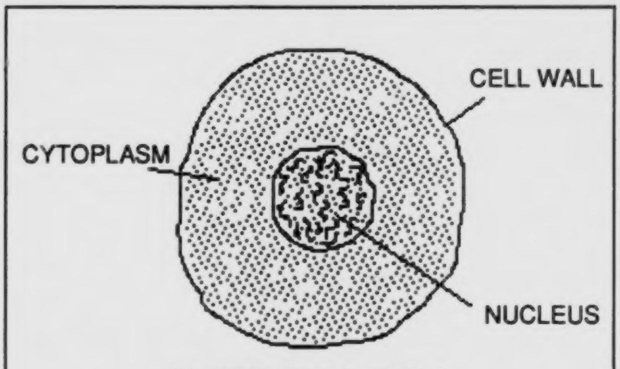
Part 2. You have inherited some traits from your parents. List two.

Example: I have my father's hair color.

5.

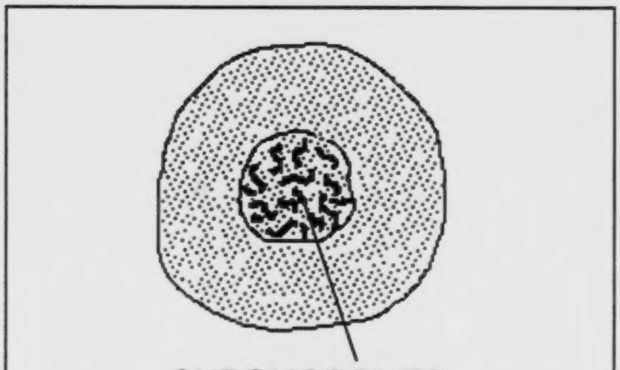
6.

## C. HOW ARE TRAITS INHERITED?



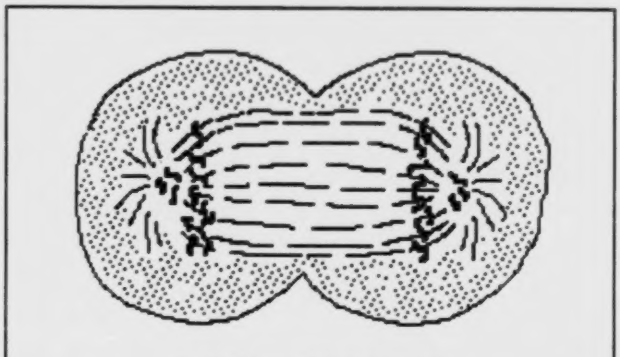
PARTS OF A CELL

An animal's body is made up of millions of tiny units called cells.



CHROMOSOMES

Each animal begins as one cell. This cell splits to make two cells. The cells continue to split and form groups of cells that make up the tissues and organs in the animal's body.



A CELL DIVIDING

Inside the nucleus of each cell are rod-shaped bodies called **chromosomes**. They come in pairs. One **chromosome** of each pair comes from the father. The other one comes from the mother.

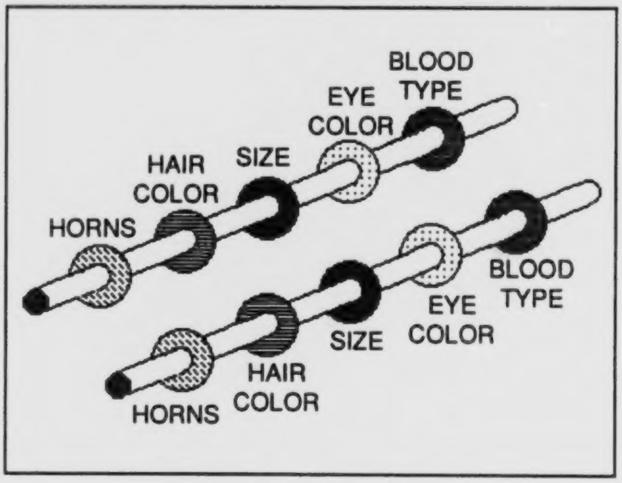
Different species of animals have different numbers of **chromosome** pairs.

Each cell in the body contains these same **chromosomes**.

| | |
|---|---|
| Cattle | 30 pairs |
| Sheep | 27 pairs |
| Swine | 19 pairs |
| Horses | 32 pairs |
| People | 23 pairs |

On each **chromosome** are tiny molecules called **genes**. **Genes** come in pairs just like **chromosomes.** They control all the different characteristics of an animal: its color, size, etc. Each animal has thousands of **genes.**

Each animal inherits certain **genes** from each parent. One **gene** in each pair comes from the father and the other comes from the mother. These **genes** will determine much of the way the animal will look and grow.


BLOOD TYPE
EYE COLOR
SIZE
HAIR COLOR
HORNS
BLOOD TYPE
EYE COLOR
SIZE
HAIR COLOR
HORNS

Remember, however, that environment, the way the animal is raised, also has a lot to do with how it will grow and develop.

## DO SKILL SHEET 2

HERITABILITY

## SKILL SHEET 2

Part 1. Match these terms with their definitions.

___ 1. cells A. rod-shaped bodies in the cell nucleus

___ 2. chromosomes B. basic units that make up all body parts

___ 3. genes C. center of each cell

___ 4. nucleus D. control all traits such as color and horns

Part 2. Choose the best answer to each question or to complete each statement.

___ 5. Which of these come in pairs?

a. chromosomes

b. genes

c. both A and B

___ 6. Each species of animal has

a. the same number of pairs of genes and chromosomes.

b. different numbers of pairs of genes and chromosomes.

c. 24 pairs of genes and chromosomes.

___ 7. Chromosomes and genes control

a. How much an animal eats.

b. Traits such as color and horns.

c. How many animals a breeder should sell.

___ 8. An animal inherits its traits

a. mostly from the mother.

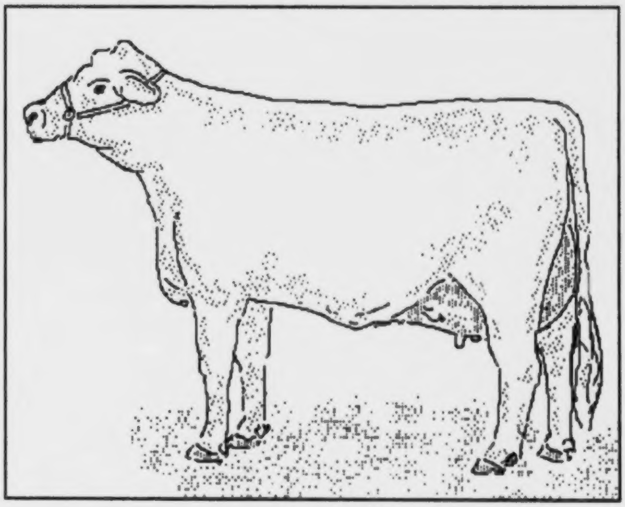
b. mostly from the father.

c. equally from both parents.

## D. WHAT ARE DOMINANT AND RECESSIVE TRAITS?

The **dominant gene** in a pair hides the effect or **trait** of the other gene. A **dominant gene** is the stronger of the two. The strong, **dominant gene** will control the **trait**.

The **gene** that is hidden is called the **recessive gene**. The **recessive gene** is the weaker **gene** in the pair.

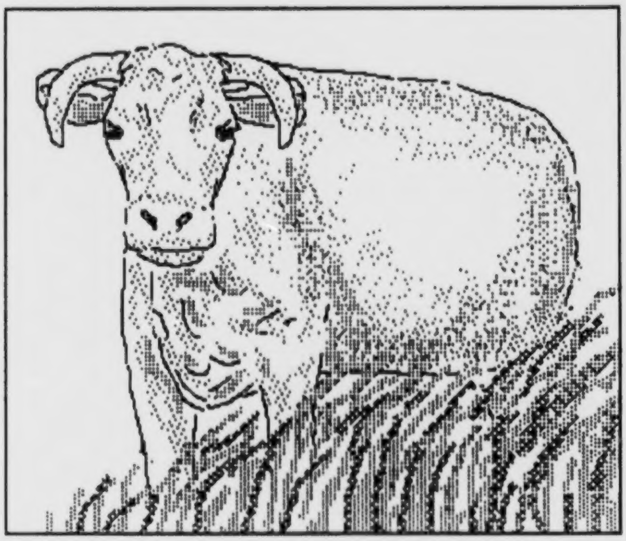


In cattle, for example, being polled (without horns) is **dominant** or stronger than being horned. The polled **trait** comes from a **dominant gene**. **Dominant genes** are written with a capital letter.

**P** = polled

The horned **trait** is **recessive** or weak. **Recessive** characteristics are written with a lower case (small) letter.

p = horned



Some examples of **dominant** and **recessive traits** are:

White face in cattle is **dominant** to colored face.

Black in horses is **dominant** to brown.

Color in animals is **dominant** to albino animals. (Albino animals lack all color.)

Rose comb in chickens is **dominant** to single comb.

**DO SKILL SHEET 3**

## HERITABILITY

# SKILL SHEET 3

Use the terms listed below to complete the following sentences. You will use some words twice.

cells
dominant
recessive
chromosomes
P
p
heritability
pairs

1. An animal's body is made up of millions of tiny units called ______________________________.

2. A recessive gene for polled cattle is written ______________.

3. Polled cattle is a ________________ trait.

4. Chromosomes come in ________________.

5. __________________ is the amount of the difference between animals that is passed from the parents to their young.

6. A dominant gene for polled in cattle is written

______________________________.

7. Horned cattle is a ___________________________ trait.

8. The gene that is hidden is called the ______________________ gene.

9. Inside the nucleus of a cell are rod-shaped bodies called

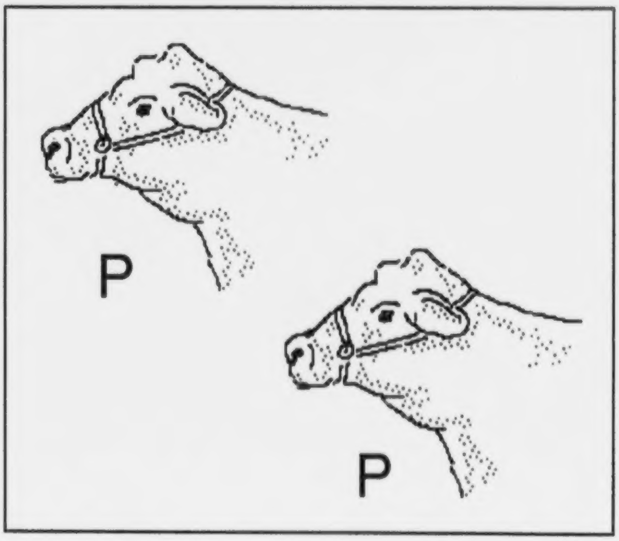
______________________.

10. A ____________________ gene is stronger and hides the other gene.

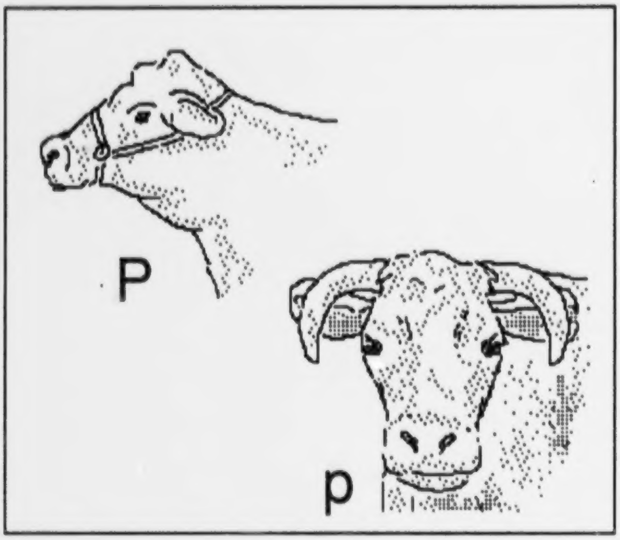
## E. WHAT ARE HETEROZYGOUS AND HOMOZYGOUS TRAITS?

**Genes** come in pairs, but both members of a pair are not necessarily alike. A **heterozygous gene** pair is one that carries two different **genes** that affect a **trait**. A **homozygous** gene pair is one that carries two genes that are just alike for a **trait**.

For example, each cow will have two **genes** for the **trait** of being horned or polled. If both **genes** are for the polled **trait**, that is a **homozygous** pair. That gene pair is written PP



If, however, one **gene** is for polled and the other is for horned, they are a **heterozygous** pair. They are different. The **heterozygous** gene pair is written Pp.



A polled cow (without horns) might carry the **gene** pair Pp. This cow is polled (because the P gene is **dominant**), but carries a **recessive gene** for the horned **trait**. If this cow is matched to a bull with a **gene** pair Pp, some of their calves will be polled and some will have horns. The horned calves will have a pp (**recessive**) **homozygous** gene pair.

## DO SKILL SHEET 4

HERITABILITY

# SKILL SHEET 4

Choose the best answer to complete each statement.

___ 1. In a homozygous pair of genes

a. the two genes are different.

b. the two genes are alike.

c. one gene is recessive.

___ 2. In a heterozygous pair of genes

a. the two genes are different.

b. the two genes are alike.

c. both genes are dominant.

___ 3. PP

a. is the symbol for a pair of recessive, heterozygous genes.

b. is the symbol for a pair of dominant heterozygous genes.

c. is the symbol for a pair of dominant homozygous genes.

___ 4. Pp is the symbol for

a. one dominant gene, one recessive genes.

b. two dominant genes.

c. two recessive genes.

___ 5. If a polled cow with a Pp gene pair is mated to a bull with a Pp gene pair,

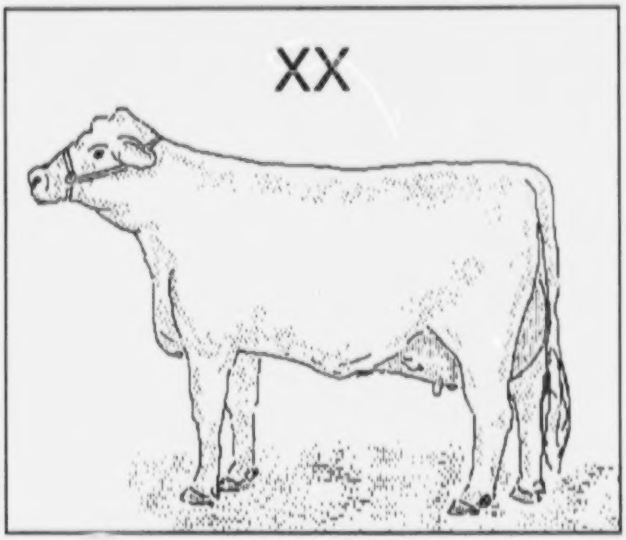
a. all of the calves will have horns.

b. all of the calves will be polled (no horns).

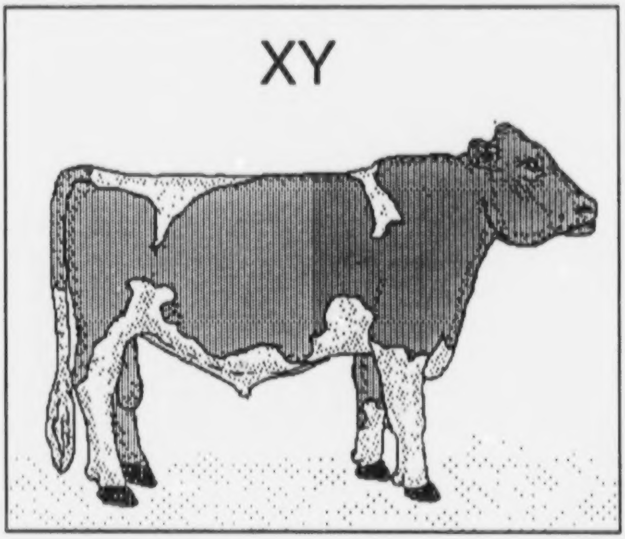
c. some of the calves will have horns, some will be polled.

## F. HOW IS THE SEX OF THE UNBORN ANIMAL DECIDED?

The sex of the new baby is determined at the moment the male sperm enters the female egg. In mammals, the sex **chromosomes** are called X and Y. The female animal has two sex **chromosomes** that are alike. These are shown as XX.



Male animals have different **chromosomes** in the pair. They are X and Y. The male pair is shown as XY.



The sex cells, called **gametes,** (egg for the female and sperm for the male) don't divide the same way other body cells do. Most cells divide into two new cells.

Each new cell has the same number of **chromosomes**.

Sex cells divide differently, however. Instead of dividing, the **chromosomes** separate. Half go to one cell and half go to another. After the sex cell has divided, each of the two new cells has half as many **chromosomes** as the original.

When the egg and the sperm come together, the two cells join together to form one complete cell. This new cell (called an embryo or fertilized egg) has complete pairs of **chromosomes** again. Half of the **chromosomes** have come from the male and half from the female.

All female eggs carry the X **chromosome**. But only half of the male sperm have the X **chromosome**. The other half have a Y **chromosome**. If an X sperm joins the X egg, the baby will be a girl. If a Y sperm joins the X egg, the baby will be a boy.

This means that the father determines the sex of the baby. He can't choose, of course, which sperm will fertilize the available egg.

Because half of the sperm are X and half are Y, about half of babies are girls. The other half are boys.

We use a checkerboard diagram called a **Punnett Square** to show what happens when the male and female join to produce new babies. This checkerboard diagram is used to predict genetic results.

**Male Gametes**

| **Female Gametes** | | X | Y |
|---|---|---|---|
| | X | XX | XY |
| | X | XX | XY |

The male **gametes** (sex cells) are X and Y. The female **gametes** are XX. Half of the babies will be female (XX). Half of the offspring are males (XY).

**DO SKILL SHEET 5**

## HERITABILITY

# SKILL SHEET 5

Match the words that go together

___ 1. XX A. female sex cell

___ 2. XY B. male sex cell

___ 3. sperm C. chromosome pair in female sex cell

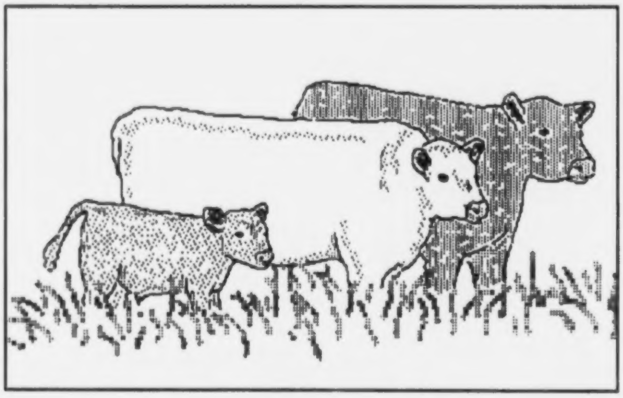
___ 4. egg D. chromosome pair in male sex cell

___ 5. father E. determines sex of baby

## G. WHAT ARE COMPLETE AND INCOMPLETE DOMINANCE?

**Incomplete dominance** is when one **gene** does not hide or block the effect of the other **gene** in a **gene** pair. Neither **gene** is **dominant**. Neither **gene** is strong enough to control. The result is a mixture of the two **traits**.

The roan (reddish brown with a mixture of white) color of shorthorn cattle is an example of **incomplete dominance**. The colors in the gene pair are red and white. Neither gene is dominant or stronger than the other. Therefore, the calves will be a mixture of the two colors.



Again we can use a checkerboard

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to diagram the combination and predict the color of the babies.

When you work problems trying to predict offspring color, both genes are shown by capital letters.

R = red

W = white

You put the male **gene** pair across the top of the checkerboard. You put the female **gene** pair along the left side.

1. If a red animal that is homozygous for red (RR) is mated with a white animal that is **homozygous** for white (WW), all the offspring are roan (reddish-brown) (RW).

**Male Gametes**

**Female Gametes**

|  | R | R |
|---|---|---|
| W | RW | RW |
| W | RW | RW |

2. A roan animal carries one R gene and one W gene (a **heterozygous**) pair. When two roan animals are mated, the offspring will be one red, two roan, and one white.

**Male Gametes**

**Female Gametes**

|   | R | W |
|---|---|---|
| R | RR | RW |
| W | RW | WW |

**DO SKILL SHEET 6**

HERITABILITY

# SKILL SHEET 6

Fill in the blanks using the following words.

white
incomplete
dominance
roan
red

1. ______________ ______________ means one gene does not hide the other in its pair. Neither gene is dominant.

2. If you mate two red animals, the babies will be _______.

3. If you mate two white animals, the babies will be ________.

4. If you mate two roan (red and white) animals and they have four babies, one will be _________, two will be___________and one will be______________.

## H. HOW DO YOU USE THE CHECKERBOARD?

You can use a checkerboard system to predict the results of crossing animals in breeding to other animals with different **traits.**

This checkerboard is called a **Punnett Square.**

1. The checkerboard looks like this.

| | | |
|---|---|---|
| | | |
| | | |
| | | |

2. The male cells are usually shown across the top of the checkerboard.

**Male**

| | | |
|---|---|---|
| | P | P |
| | | |
| | | |

3. The female cells are usually shown along the left side of the checkerboard.

**Female**

| | | |
|---|---|---|
| | | |
| P | | |
| P | | |

4. The offspring (babies are shown in the shaded area.

**Male**

**Female**

| | P | P |
|---|---|---|
| P | PP | PP |
| P | PP | PP |

You would show a cross between two polled, **homozygous** cattle like this:

**Male**

**Female**

| | P | P |
|---|---|---|
| P | PP | PP |
| P | PP | PP |

All the calves (shown in the shaded part of the checkerboard are **homozygous** for the polled **trait**. All calves from this mating will have **gene** pairs PP. All of the calves will be polled.

You would show a cross between two cattle that are **heterozygous** for the polled **trait** like this:

**Male**

**Female**

| | P | p |
|---|---|---|
| P | PP | Pp |
| p | Pp | pp |

Remember, the P (polled) **gene** is **dominant**. It will hide the effect of the p (horned) **gene**.

**Male**

| | | **P** | **p** |
|---|---|---|---|
| **Female** | **P** | **PP** | **Pp** |
| | **p** | **Pp** | **pp** |

1. One calf is PP. It will be polled.

2. Two calves are Pp. They carry both **genes**, but because the polled characteristic is **dominant**, they will both be polled.

3. One calf is pp. Because this calf carries two **recessive genes**, it will be horned

## CROSSOVER

The results of breeding don't always turn out the way we predict. Sometimes this is because of crossover. The **chromosomes** line up together when the cell divides. Occasionally the chromosomes cross over each other and split to form a new **chromosome** with a different combination of **genes**.

## MUTATION

Another reason that **genetic** predictions may fail is mutation. Something happens to a **gene** to cause it to change. Some mutations are beneficial; others are harmful.

**DO SKILL SHEET 7**

244

## HERITABILITY

# SKILL SHEET 7

Fill in the Punnett Square on the back of this page. Here is your information:

Black is the dominant color in horses. Black equals B

Brown is the recessive color in horses. Brown equals b

You are mating a black female with heterozygous genes Bb

To a black male with heterozygous genes Bb.

Remember a capital B means the black gene is dominant. It will mask or hide the brown b gene.

| | | |
|---|---|---|
| | | |
| | | |
| | | |

Out of four babies these parents produce,

Three will be________________

One will be__________________

## I. WHAT ARE PHENOTYPES AND GENOTYPES?

**Genotype** is the structure of the **gene** pair. There are three **genotypes** for polled or horned cattle.

1. An animal may have two **dominant** polled **genes**. (PP)

2. An animal may have one **dominant** and one **recessive** polled **gene**. (Pp)

3. An animal may have two **recessive** polled **genes**. (pp)

These **gene** combinations are called **genotypes**.

**Phenotype** refers to how the animal looks. An animal is polled or horned. An animal is white, red or roan. Those are **phenotypes**.

1. A cross between two polled cattle which are **homozygous** for the polled **trait** would be set up like this:

**Male Gametes**

**Female Gametes**

|  | P | P |
|---|---|---|
| P | PP | PP |
| P | PP | PP |

All of the calves (shown in the shaded part of the checkerboard) are **homozygous** for the polled **trait**. The **phenotype** of the calves is polled.

All babies from this mating will have the **genotype** PP.

## DO SKILL SHEET 8

## DO ACTIVITY SHEET 1

HERITABILITY

## SKILL SHEET 8

Directions: Use terms below to complete the following sentences.

checkerboard
male
female
heterozygous
father
mother
homozygous
incomplete dominance
phenotype
genotype

1. The ______ sex cell is written XY.

2. A _________ system is used to predict breeding results.

3. The ________ does not determine the sex of the baby.

4. A ____________ gene pair carries two different genes.

5. ___________________ ________________ takes place when one gene does not hide the effect of the other gene.

6. The ____________sex cell is written XX.

7. __________ refers to the physical appearance of the animal.

8. The __________determines the sex of the baby.

9. A ____________ gene pair carries two genes that are alike.

10. ___________refers to the kinds of gene pairs an animal has.

HERITABILITY

# ACTIVITY SHEET 1

Equipment:

Chalkboard and chalk

Construction paper and markers

Directions: Using either the chalkboard or construction paper, make a checkerboard to predict the results of the following:

1. The sex of the unborn animal

   XX = female parent

   XY = male parent

2. Two roan animals are mated

   RW = female parent

   RW = male parent

3. A cross between two cattle that are heterozygous for the polled trait

   Pp = female parent

   Pp = male parent

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## HERITABILITY

# UNIT TEST

Part 1. Beside each statement below, put a "T" if the statement is true and an "F" if the statement is false.

____ 1. Some traits have a better chance of being inherited than other traits.

____ 2. The mother determines the sex of the offspring.

____ 3. The chromosomes are located in the nucleus of a cell.

____ 4. Traits are inherited from the chromosomes from the father and the mother.

____ 5. Cells do not split

____ 6. A dominant gene is the hidden gene.

____ 7. A recessive gene hides the other gene.

____ 8. In cattle, being horned is a recessive trait.

Part 2. Circle the letter of the best answer to the question.

9. In a gene pair that carries two genes that are alike, the gene pair is?

| | | | |
|---|---|---|---|
| a. | heterozygous | b. | homozygous |

10. In a gene pair that carries two genes that are different, the gene pair is?

| | | | |
|---|---|---|---|
| a. | heterozygous | b. | homozygous |

11. Another name for the checkerboard is?

| | | | |
|---|---|---|---|
| a. | "pickett" square | b. | "Puckett" square |
| c. | "Pummet" square | d. | "Punnett" square |

12. Phenotype refers to the?

| | | | |
|---|---|---|---|
| a. | chromosomes | b. | kinds of gene pairs possessed |
| c. | incomplete dominance | d. | physical appearance |

13. Genotype refers to the?

| | | | |
|---|---|---|---|
| a. | chromosomes | b. | kinds of gene pairs possessed |
| b. | incomplete dominance | d. | physical appearance |

14. On a checkerboard when determining the sex of the offspring, female is written.

| | | | |
|---|---|---|---|
| a. | XX | b. | Xx |
| c. | XY | d. | Xy |

15. On a checkerboard when determining the sex of the offspring, male is written.

    a. XX
    b. Xx
    c. XY
    d. Xy

Part 3. Using the checkerboard below fill in the blanks for B=black and b=red cattle.

Bb = female parent
Bb = male parent

**Male**

**Female**

|  |  |  |
|---|---|---|
|  |  |  |
|  |  |  |
|  |  |  |

HERITABILITY

# PERFORMANCE CHECKLIST

Student ____________________ successfully performed the following tasks:

| TASK | YES | NO | COMMENTS |
|---|---|---|---|
| 1. Defined heritability. | | | |
| 2. Explained how traits are inherited. | | | |
| 3. Explained dominant and recessive traits. | | | |
| 4. Explained heterozygous and homozygous traits. | | | |
| 5. Charted how the sex of an unborn animal is determined. | | | |
| 6. Explained complete and incomplete dominance. | | | |
| 7. Explained phenotypes and genotypes. | | | |
| 8. Used the "Punnett" Square. | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

Student's Signature/Date

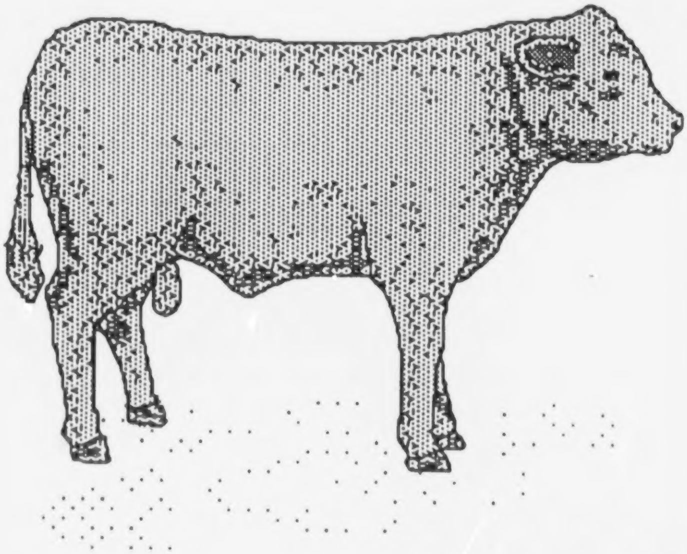
Instructor's Signature/Date

90-1400-S

# Agricultural Science I

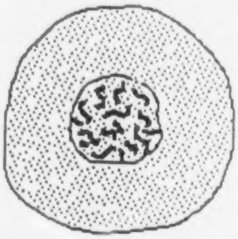
## SUPPLEMENTARY UNITS

## Genetic Improvement



**Male Gametes**

| Female Gametes | | R | W |
|---|---|---|---|
| | R | RR | RW |
| | W | RW | WW |



CHROMOSOMES

Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

## INTRODUCTION

Breeders raise animals by mating them with other animals. They look for ways to improve the quality of animals. Breeders study the males and females to decide which traits they want to improve. They breed their animals with certain goals in mind. Selective breeding produces improved quality.

## OBJECTIVE

After you complete this unit, you should be able to explain how to make wise choices in breeding that will improve your livestock.

## STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. What are heritability estimates?
2. How does the heritability of genes affect the quality of the offspring?
3. What are highly heritable traits (that increase cost efficiency)?
4. How are heritability estimates used?

Put a check beside the statement that is true for you.

☐ I can do these tasks and want to go through the Performance Checklist.

SEE YOUR INSTRUCTOR

☐ I want to study the information in this unit before I do the Performance Checklist.

TURN PAGE AND BEGIN

## A. TERMS

1. **Heritability** - (hair-it-ah-bill-it-tea) is the amount of the difference between animals that is passed from the parents to the babies. These are characteristics not greatly affected by the animal's environment.
2. **Cost efficiency** - (cost e-fish-un-see) getting the most for your money.
3. **Feed efficiency** - (feed e-fish-un-see) getting the most growth or production from the least food expense.
4. **Polled** - (poll-d) naturally without horns (cattle).
5. **Profit** - (prah-fit) the amount of money earned after all expenses have been paid.

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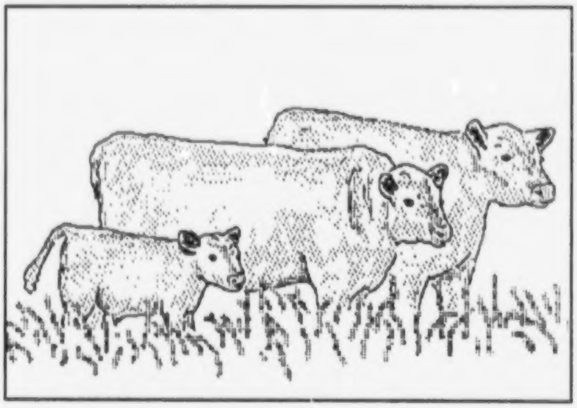
## B. WHAT ARE HERITABILITY ESTIMATES?

A **heritability** estimate tells how likely it is that a certain trait will be passed from parents to their babies. If a trait has a high **heritability**, the trait will probably show up in the first generation of babies. Improving your herd will be fast.



For traits with a low **heritability**, the improvement is slow. In other words, it takes several generations of animals for the good trait to become strong.

Animal breeders choose traits that are important to them. The choices depend on how they are using the animals. For example, a dairy breeds its cows to improve milk production. A horse breeder may be looking for strength or power. In other animals color or size may be important.

The following charts list a few **heritability** estimates for cattle and swine. Each estimate is a percent figure. It gives the odds that a trait will be passed from parents to babies.

1. Low **heritability**: less than 25%
2. Medium **heritability**: 25 to 50%
3. High **heritability**: includes traits over 50%

Table 1--Heritability Estimates For Economic Traits in Beef Cattle*

| TRAITS | PERCENT HERITABLE | |
|---|---|---|
| Fertility | 10% | .10 |
| Weaning Weight | 25% | .25 |
| Type Score at Weaning | 33% | .33 |
| Rate of Gain in Feed Lot | 57% | .57 |
| Efficiency of Gain in Feed Lot | 36% | .36 |
| Slaughter Grade | 47% | .47 |
| yearling Weight | 60% | .60 |
| Carcass Items: | | |
| Dressing Percent | 46% | .46 |
| Carcass Grade | 48% | .48 |
| Thickness of Fat | 38% | .38 |
| Area of Loin Eye Muscle | 70% | .70 |

Table 2--Heritability Estimates For Economic Traits in Swine

| TRAITS | PERCENT HERITABLE | |
|---|---|---|
| Number of Pigs Farrowed | 15% | .15 |
| Number of Pigs Weaned | 19% | .19 |
| Litter Weight at Five Months | 17% | .17 |
| Weight of Pig at Five Months | 21% | .21 |
| Growth Rate (Weaning to 200 lbs.) | 30% | .30 |
| Efficiency of Gain | 38% | .38 |
| Carcass Items: | | |
| Carcass Length | 61% | .61 |
| Thickness of Backfat | 46% | .46 |
| Area of Loin Eye | 48% | .48 |
| Percent of Shoulder | 47% | .47 |
| Percent of Ham | 58% | .58 |
| Percent of Fat Cuts | 60% | .60 |
| Percent of Lean Cuts | 34% | .34 |

*From "How to FIND ANIMALS with superior BREEDING ABILITY," John F. Lasley and Billy N. Day

Table 3 PERCENT HERITABILITY

| Trait | Cattle | Sheep | Swine | Poultry | Rab | Horse |
|---|---|---|---|---|---|---|
| Fertility | 0-15 | 0-15 | 0-15 | 0-15 | - | Low |
| Number of young weaned | 10-15 | 10-15 | 10-15 | - | 3 | - |
| Weight of young at weaning | 15-25 | 15-20 | 15-20 | - | 35 | - |
| Postweaning rate of gain | 50-55 | 50-60 | 25-30 | - | 60 | - |
| Postweaning gain efficiency | 40-50 | 20-30 | 30-35 | - | - | - |
| Fat thickness over loin | 45-50 | - | 40-50 | - | - | - |
| Loin-eye area | 50-60 | - | 30-40 | - | 60 | - |
| Percent lean cuts | 40-50 | - | - | - | 60 | - |
| Milk production, lb | 25-30 | - | - | - | - | - |
| Milk fat, lb | 25-30 | - | - | - | - | - |
| Milk solids, nonfat, lb | 30-35 | - | - | - | - | - |
| Total milk solids, lb | 30-35 | - | - | - | - | - |
| Body weight | - | - | - | 35-45 | 40 | - |
| Feed efficiency | - | - | - | 20-25 | - | - |
| Total egg production | - | - | - | 20-30 | - | - |
| Age at sexual maturity | - | - | - | 30-40 | - | - |
| Viability | - | - | - | 5-10 | - | - |
| Speed | - | - | - | - | - | 25-50 |
| Wither height | - | - | - | - | - | 25-60 |
| Body length | - | - | - | - | - | 25 |
| Heart girth circumference | - | - | - | - | - | 34 |
| Cannon bone circumference | - | - | - | - | - | 19 |
| Points for movement | - | - | - | - | - | 40 |
| Temperament | - | - | - | - |  | 25 |

The rates of heritability for certain traits of domestic animals (Courtesy Instructional Materials Service, Texas A&M University)

**DO SKILL SHEET 1**

## GENETIC IMPROVEMENT

# SKILL SHEET 1

Part 1. Use Table 1, Heritability estimates for economic traits in beef cattle (page 7). Find the trait below. Place an (L) for low, (M) for medium and (H) for high.

___ 1. Fertility

___ 2. Efficiency of gain in feed lot

___ 3. Yearling weight

Part 2. Fill in the blanks using these words or numbers

| | | |
|---|---|---|
| production | used | 25 |
| 50 | likely | estimate |

4. A Heritability _____________ tells how _______ it is that a trait will be passed from parents to offspring.

5. Animal breeders choose traits that are important depending on how the animal is __________ _____________.

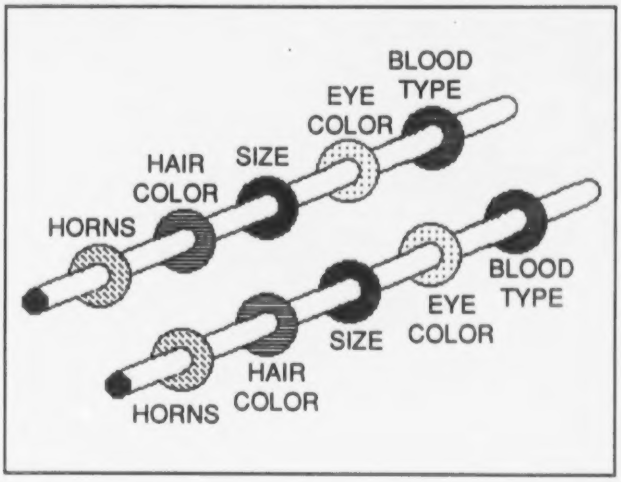
6. Dairy cows are bred to improve ___________ ________

7. Low heritability is less than _____________ percent.

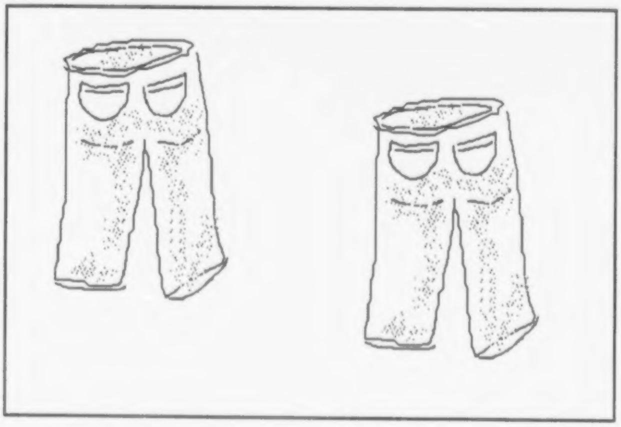
8. Medium heritability is _________ to _______ percent.

9. High heritability is over _____________ percent.

## C. HOW DOES THE HERITABILITY OF GENES AFFECT THE QUALITY OF THE OFFSPRING?


BLOOD TYPE
EYE COLOR
SIZE
HAIR COLOR
HORNS
BLOOD TYPE
EYE COLOR
SIZE
HAIR COLOR
HORNS

Each animal is made up of many different features. Its color, size, being horned or polled, and carcass traits are inherited from its parents. These traits are controlled by genes.



Genes are tiny molecules located on the chromosomes. Each animal has thousands of genes. The genes come in pairs.

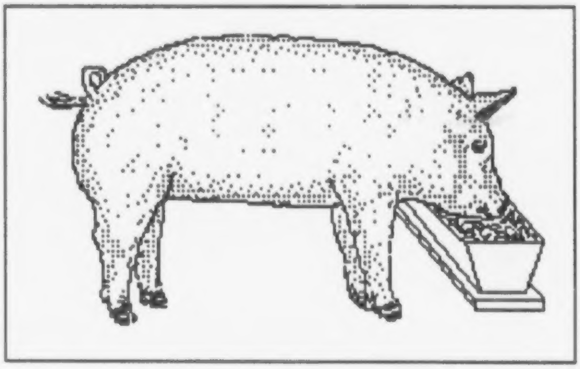
One trait controlled by a single pair of genes is the color of the animal.

If you mate a red male animal to a white female animal, all the babies will be roan (a mixture of the colors).

|  |  | Male Gametes |  |
|---|---|---|---|
| Female Gametes |  | R | R |
|  | W | RW | RW |
|  | W | RW | RW |

Most of the traits that are important in animals are controlled by many pairs of genes. The most important traits are those that increase size, milk production, growth rate, etc.

Of course, how you care for the animal is important, too. If you don't feed an animal right, it may never reach the size or weight that your breeding program had predicted. Things such as food and shelter are called environmental factors.



## DO SKILL SHEET 2

## GENETIC IMPROVEMENT

# SKILL SHEET 2

Put a (T) before each true statement and an (F) before each false statement.

___ 1. All animals have the same features.

___ 2. Each trait in an animal is controlled by the brain.

___ 3. Genes control all traits in animals.

___ 4. One pair of genes controls an animal's color.

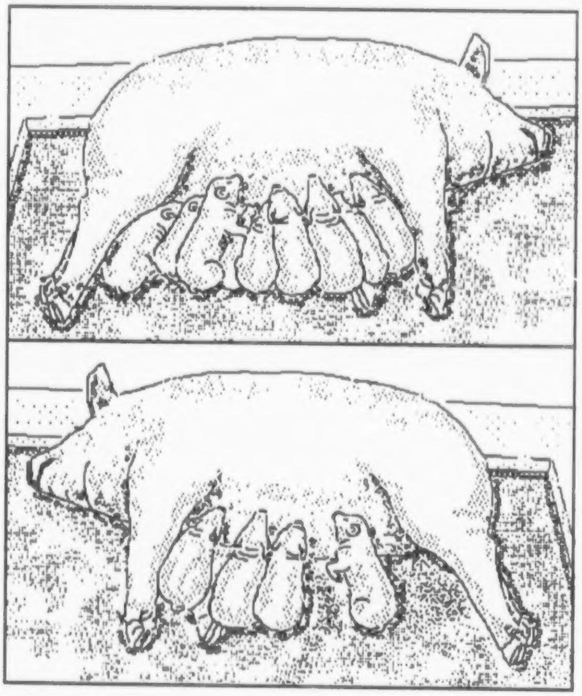
___ 5. Most important traits are controlled by many genes.

___ 6. It doesn't matter how you care for an animal. How the animal turns out is determined by its genes.

## D. WHAT HERITABLE TRAITS INCREASE COST EFFICIENCY?

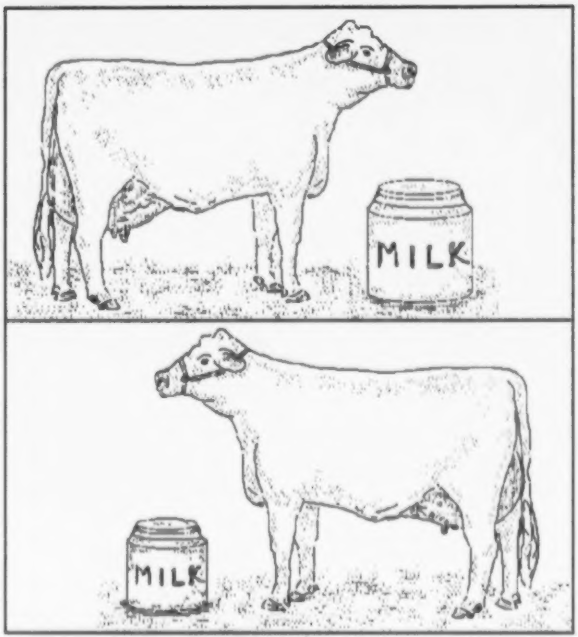
People decide which traits they want in animals. Then they include animals with these good traits in the breeding program. We call this process genetic improvement. That means using what we know about genes to raise the kind of animals we want.

Over a period of time, the young animals that come from this selective breeding show more and more of the good traits.

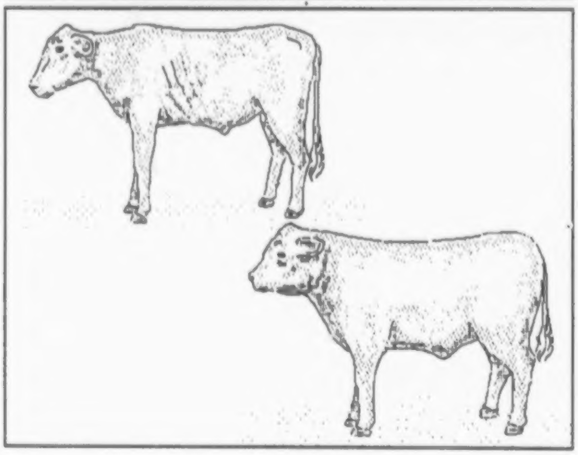


1. The size of a litter of pigs is important. The more pigs in a litter, the more pigs the farmer will have to sell. The more pigs sold, the more profit for the farmer.

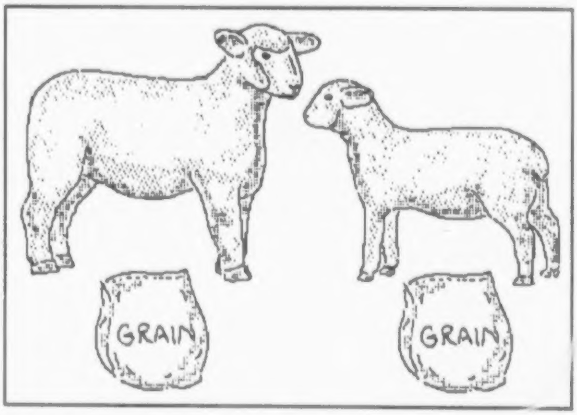
2. How much milk a dairy cow produces is important. The cows that produce the most milk will make the most money for the breeder.



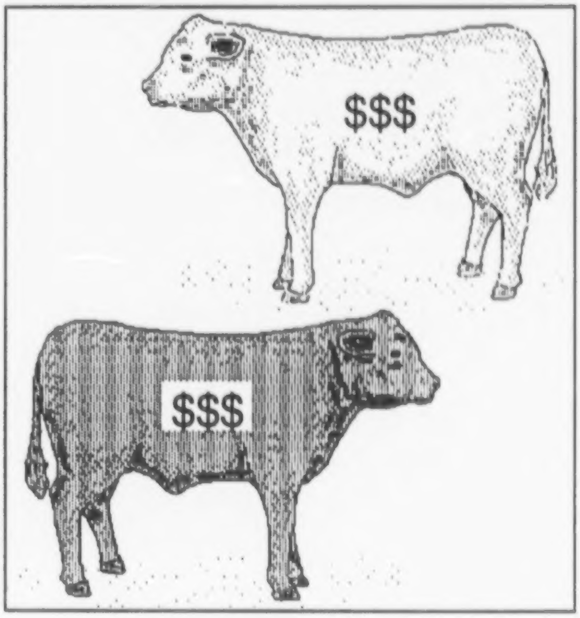
3. The owner is also concerned about how fast and how big an animal grows. Larger, heavier animals usually make more money for owners than small, thin animals.



4. A farmer wants to breed animals that have high **feed efficiency**. Animals that grow well on smaller amounts of feed make more money for the farmer than animals that eat a lot.



5. Color, on the other hand, may not be very important to cattle breeders. A white steer does not usually bring more money at the market than a black steer. Hair color is not a money-making trait for the person raising feeder steers.



Herd owners should not try to develop in too many traits all at once. It is better to breed for one or two traits at a time. If a breeder chooses more than three traits, progress will be slow and limited for each trait.

## DO SKILL SHEET 3

## GENETIC IMPROVEMENT

# SKILL SHEET 3

List four traits a breeder might want to improve. These will be traits that help make more money.

1.

2.

3.

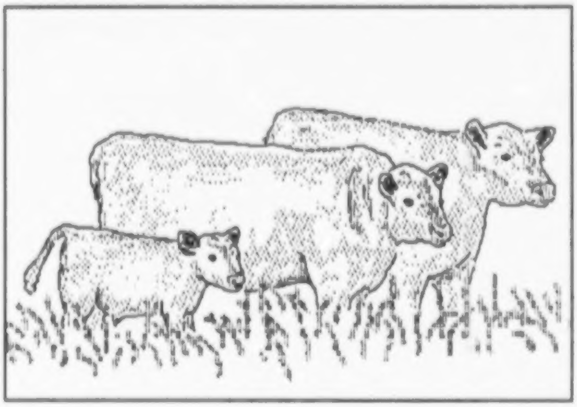
4.

List 1 trait that probably doesn't help make money.

5.

## E. HOW ARE HERITABILITY ESTIMATES USED?

You remember that a **heritability** estimate tells what the chances are that parents will pass a certain trait to their children. Breeders use **heritability** estimates to improve the quality of the animals they raise.



Breeders want to improve certain traits in animals in order to make more money. For example, nursing ability in cows is important. A calf gains much of its weight between birth and weaning. So the owner would breed for good nursing ability.

Breeders use **heritability** estimates to help decide which herd male to buy or which male semen to use. Breeders use **heritability** estimates to decide which females to keep in the herd.

## DO ACTIVITY SHEET 1

## GENETIC IMPROVEMENT

# ACTIVITY SHEET 1

Directions: Contact a friend or neighbor who raises animals. Do this in person or by phone. Ask these questions and be ready to share what you learn with the class.

Name of breeder________________________ Address________________

1. What kind of animals do you raise?

2. What traits are you trying to develop or strengthen in your animals?
   A.
   B.

3. How do you try to accomplish this,
   A. In the males you choose?

   B. In the females you use?

4. Do you use heritability estimates?

5. What are your sources of information for breeding decisions?

6. Do you feel you're being successful in improving your animals genetically? Why or why not?

## GENETIC IMPROVEMENT

## UNIT TEST

Part 1. Choose the best response to complete each statement.

____ 1. Low heritability is less than __________ percent.
a. 15  b. 20  c. 25

____ 2. Medium heritability is __________ to __________ percent.
a. 15 - 30  b. 25 - 50  c. 40 - 50

____ 3. High heritability is over ______________ percent.
a. 60  b. 50  c. 40

____ 4. The color of the animal is controlled by ________ pair(s) of genes.
a. one  b. two  c. many

____ 5. Most of the traits that are important in animals are controlled by____________pairs of genes.
a. one  b. two  c. many

____ 6. Experts recommend to breed for __________trait(s) at one time.
a. one  b. one or two  c. three or four

____ 7. The farmer or breeder wants to improve animals in order to ____

a. impress the neighbors b. be sure none die

c. make more money

Part 2. Using the chart below, place an (L) for low, (M) for medium and (H) for high heritability estimates.

Animal Breed, Heritability Estimates

| | | Trait | Heritability % |
|---|---|---|---|
| | | **BEEF** | |
| ____ | 8. | Birth weight | 40% |
| ____ | 9. | Fertility (calving interval) | 10% |
| ____ | 10. | Gain on pasture | 30-45% |
| ____ | 11. | Yearling weight | 60% |
| ____ | 12. | Weaning weight | 25-30% |
| | | **SWINE** | |
| ____ | 13. | Number of pigs weaned | 10% |
| ____ | 14. | Carcass length | 60% |
| ____ | 15. | Growth rate (weaning to 200 lbs) | 30% |

GENETIC IMPROVEMENT

# PERFORMANCE CHECKLIST

Student______________________ successfully performed the following tasks:

| TASK | YES | NO | COMMENT |
|---|---|---|---|
| 1. Defined heritability estimates | | | |
| 2. Explained how the heritability of genes affects the quality of the offspring. | | | |
| 3. Identified highly heritable traits that increase cost efficiency. | | | |
| 4. Used heritability estimates. | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

______________________
Student's Signature/Date

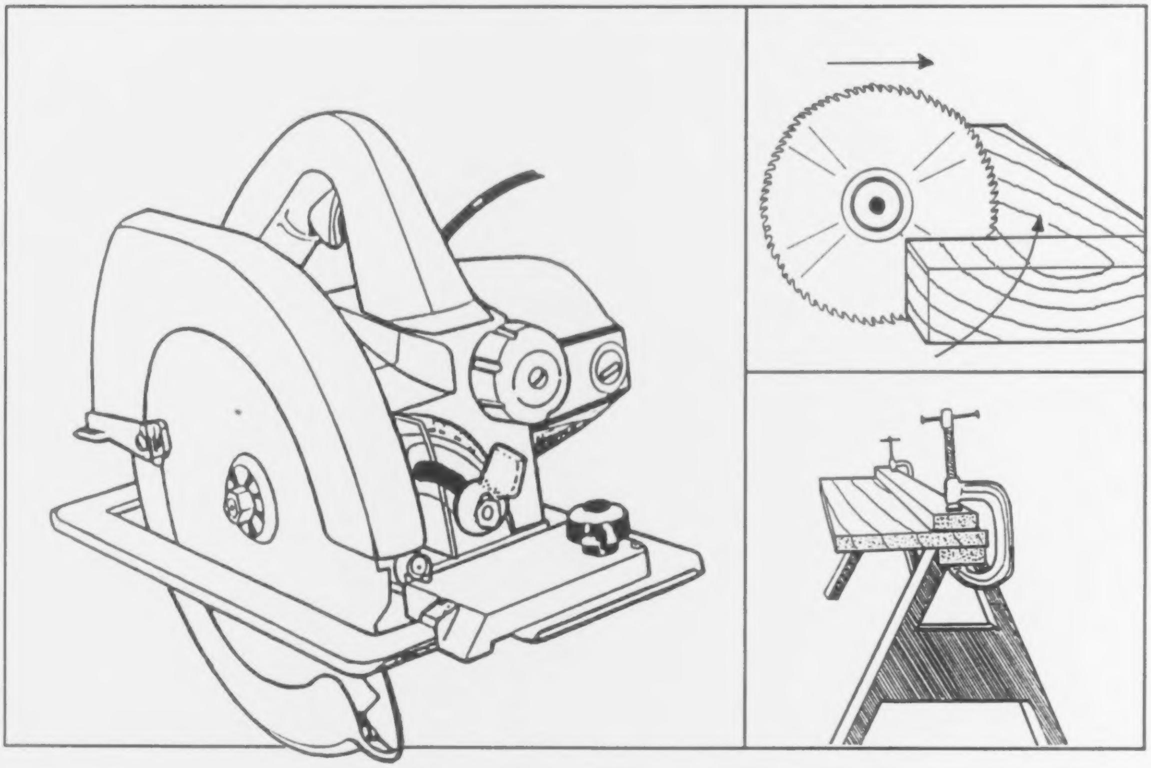
______________________
Instructor's Signature/Date

90-1400-S

# Agricultural Science I

## SUPPLEMENTARY UNITS

## Portable Electric Saw



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Columbia, MO 65211

## INTRODUCTION

A portable electric saw often makes a woodworking job easier. You must know which jobs can best use this saw. You must also know how to set and adjust the portable saw for safe operation.

## OBJECTIVE

After you complete this unit, you should be able to select and adjust the portable electric saw and use proper safety procedures while cutting materials.

## STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. When should you use a portable electric saw?
2. How can you match the quality of the portable electric saw with the job to be done?
3. What are the parts of a portable electric saw?
4. Which blades are best for different jobs?

5. How do you adjust the saw properly?

6. How do you secure the wood safely?

7. How do you operate an electric saw in a safe manner?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

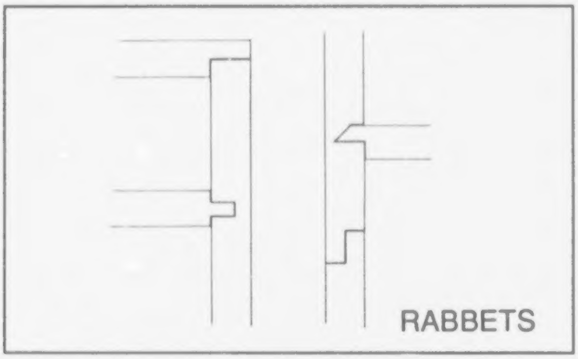
**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

## A. TERMS

1. **Stationary saw** - (stay-shun-ary) saw supported by the floor or a bench and not easily moved. Examples are a table circular saw or a radial-arm saw.
2. **Portable saw** - (port-a-bul) saw that can be carried to the job.
3. **Stock** - (stok) the wood or other material that is to be cut.
4. **Bevel** - (bev-l) a tilt angle for the wood to be cut.
5. **Miter** - (my-ter) a catty-corner (diagonal) cut.
6. **Kerf** - (ker-f) the opening in the wood behind the saw blade.
7. **Rabbeting** - (rab it-ing) cutting a groove or cut in the edge of a board so that another piece may be fitted into it to form a joint.



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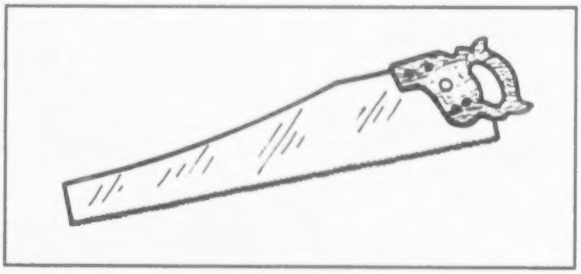
## B. WHEN SHOULD YOU USE A PORTABLE ELECTRIC SAW?

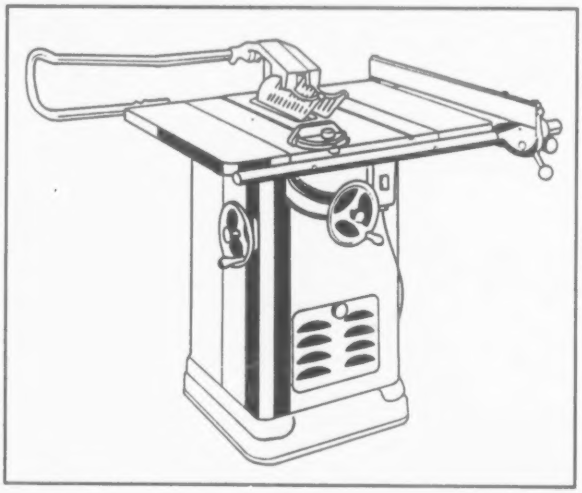
You can use a **portable electric saw** for many jobs: ripping, crosscutting, **bevelling**, **rabbeting**, cutting groves and **mitering**. With the right blades, the saw can do many jobs well.

For each job, however, you must decide if the **portable electric saw** is the best tool to use.

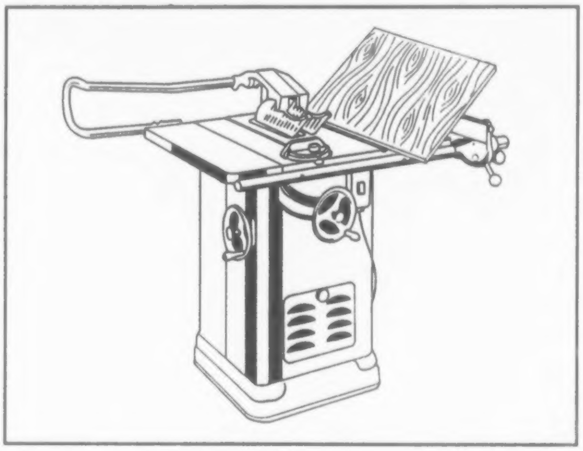
1. Decide if it would be more trouble to use a **portable electric saw** than a hand saw.



2. Determine if precision and accuracy are required. If so, use a **stationary saw**.

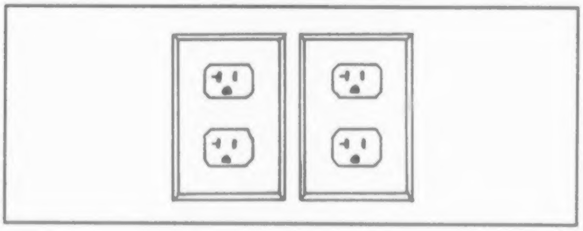


3. Look around and see if a **stationary saw** is already set up and easily accessible.



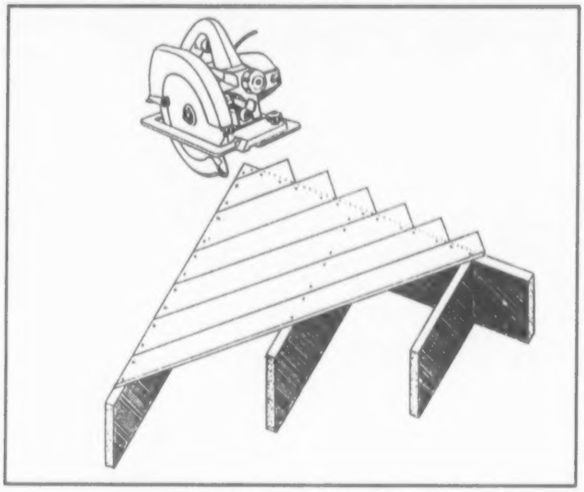
4. Decide if the material to be cut is too large for a **stationary saw**.

5. Check to see if electricity is available.

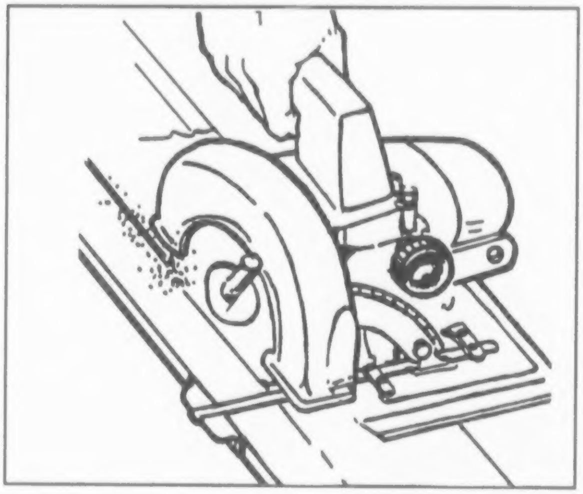


6. See if the work areas are inaccessible for larger electric saws.

7. Use the **portable electric saw** to trim ends of work.



8. The **portable electric saw** is mainly used for cutting wood. However, you can often use it to cut metal, masonry products, glass, ceramics, and even some concrete products.



## DO SKILL SHEET 1

USING A PORTABLE ELECTRIC SAW

# SKILL SHEET 1

Part 1. Choose the best answer to complete each statement.

___ 1. Use a portable electric saw
- a. for every farm woodworking job.
- b. when the job would be faster or easier than using another kind of saw.

___ 2. A portable electric saw is
- a. less precise and accurate than a stationary saw.
- b. more precise and accurate than a stationary saw.

___ 3. It might be foolish to use a portable electric saw
- a. if a stationary saw was already set up and easily available.
- b. if you need to cut something quickly.

___ 4. A portable electric saw is good to use when
- a. a piece of material is very small.
- b. a piece of material is too large for a stationary saw.

___ 5. You can't use a portable electric saw if
   a. you're under 21.
   b. no electricity is available.

___ 6. A portable electric saw is especially useful
   a. for tight, inaccessible spaces.
   b. work that must be very precise and accurate.

___ 7. A portable electric saw works well in trimming
   a. the ends of a piece of work.
   b. complicated center cuts.

Part 2.

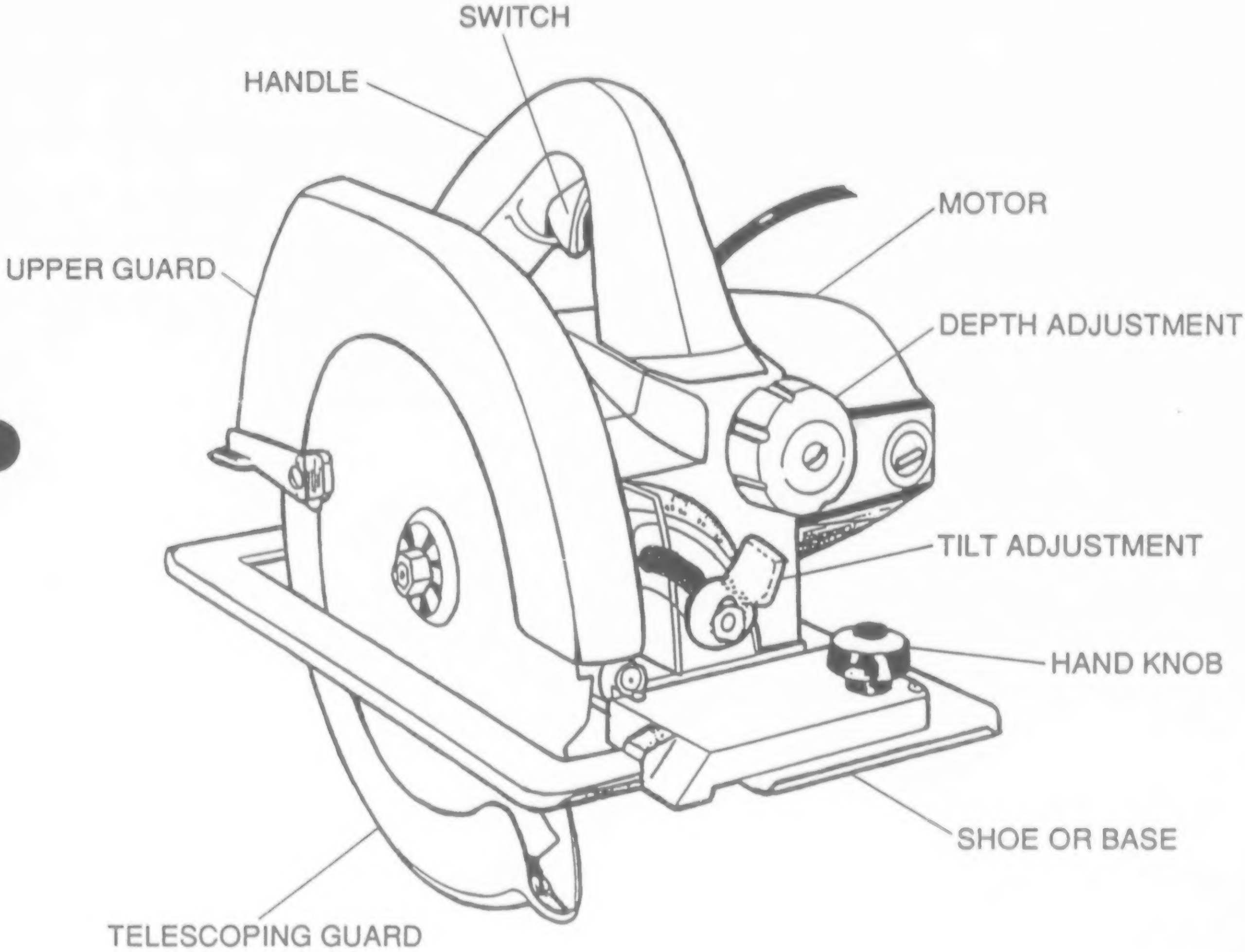
8. List three jobs that can be done with a portable electric saw.

______________ ______________ ______________

9. List three types of materials (besides wood) that can be sawed with a portable electric saw.

______________ ______________ ______________

## C. WHAT ARE THE PARTS OF A PORTABLE ELECTRIC SAW?


SWITCH
HANDLE
MOTOR
UPPER GUARD
DEPTH ADJUSTMENT
TILT ADJUSTMENT
HAND KNOB
SHOE OR BASE
TELESCOPING GUARD

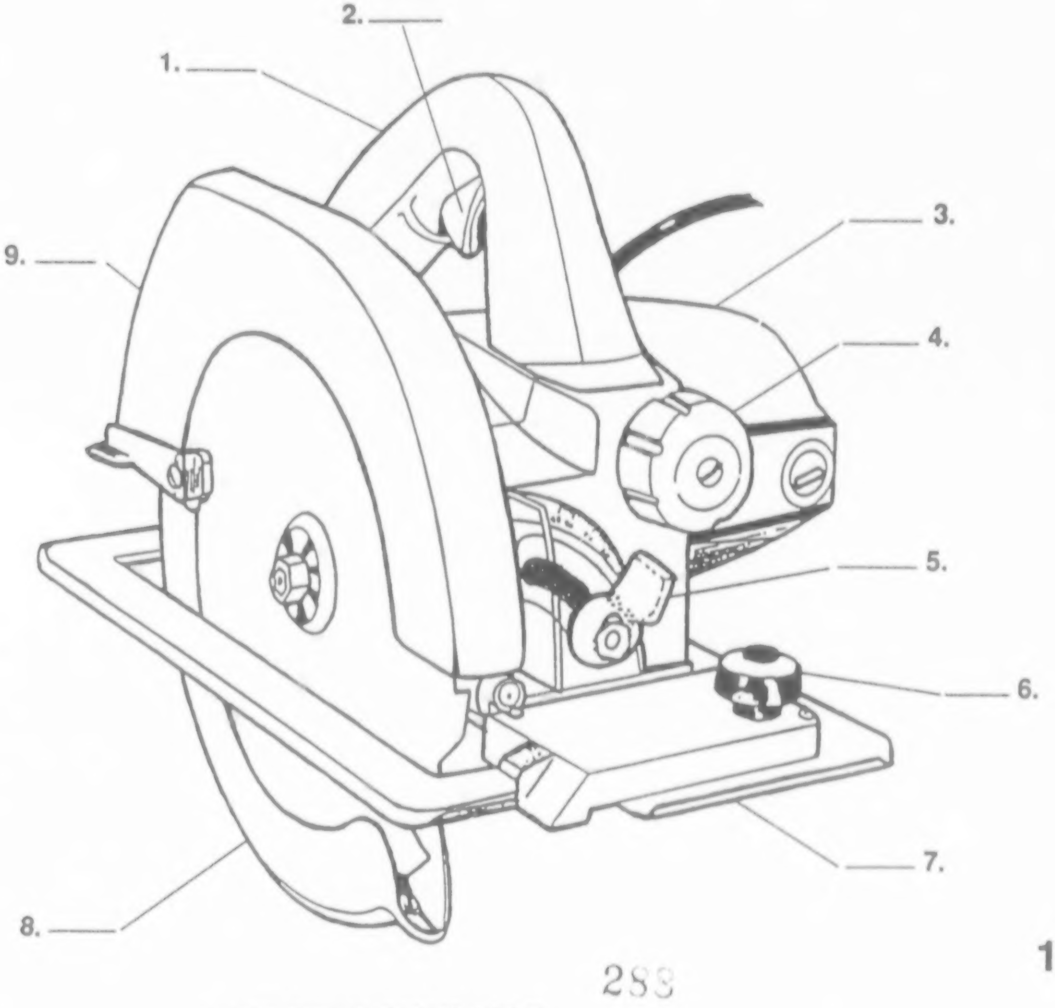
## DO SKILL SHEET 2

USING A PORTABLE ELECTRIC SAW

## SKILL SHEET 2

Choose the correct label and write its letter on the line.

a. switch
b. handle
c. shoe or base
d. hand knob
e. upper guard
f. motor
g. telescoping guard
h. tilt adjustment
i. depth adjustment



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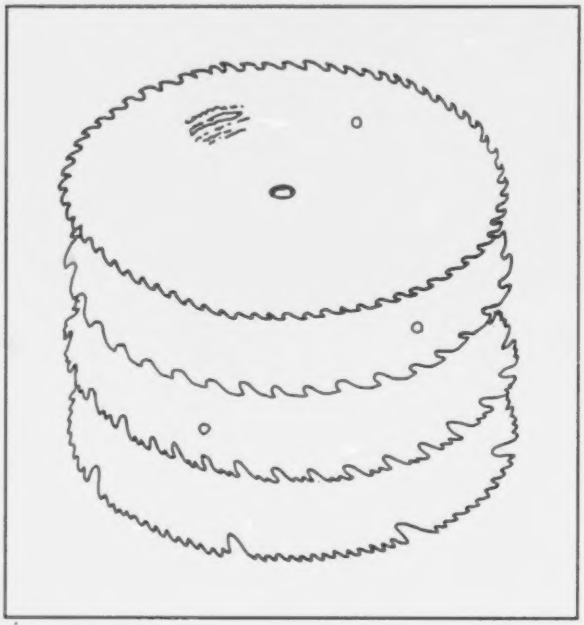
## D. WHICH BLADES ARE BEST FOR DIFFERENT JOBS?

Many companies make circular saws. How a saw will cut depends on:

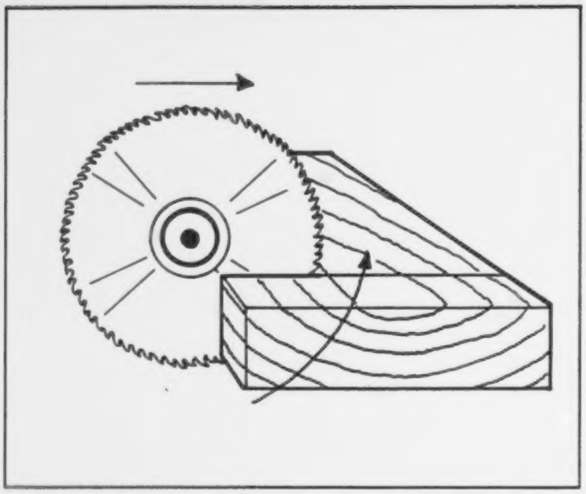
1. the material from which the blade is made
2. the shape of the teeth
3. how many teeth the saw blade has



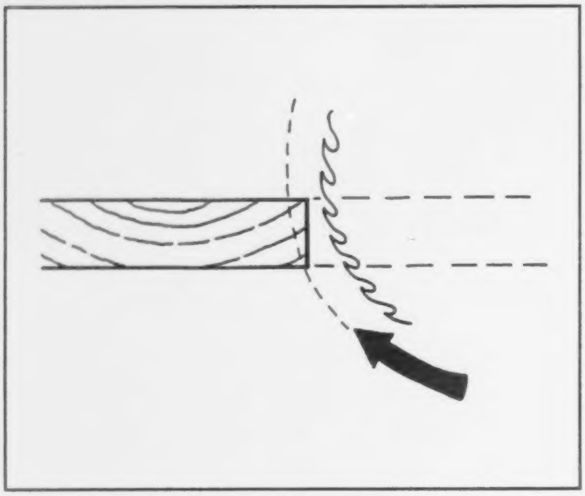
High-speed steel blades make clean cuts. However, these blades must be changed and sharpened often. In commercial use, a steel blade will have to be cleaned and sharpened daily.

Carbide blades may be used for a long time (three to four weeks for commercial use). Buying a new carbide blade may be as cheap as paying to have one sharpened. Carbide blades are slow at ripping solid stock. Carbide blades are more fragile than steel and must be handled more carefully.

The finer the saw teeth, the fewer splinters.



(Blades cut as they spin forward and up. The work will have less splinters on the bottom side of the material.)

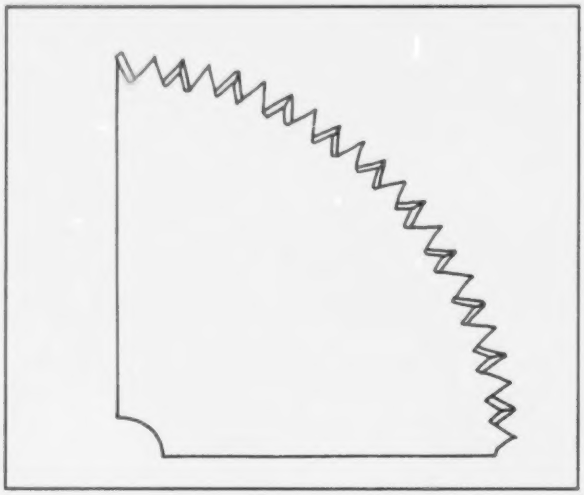


You can buy special blades to cut metals, plastics, and masonry. Be sure the blade you use is made for the specific material you are cutting.

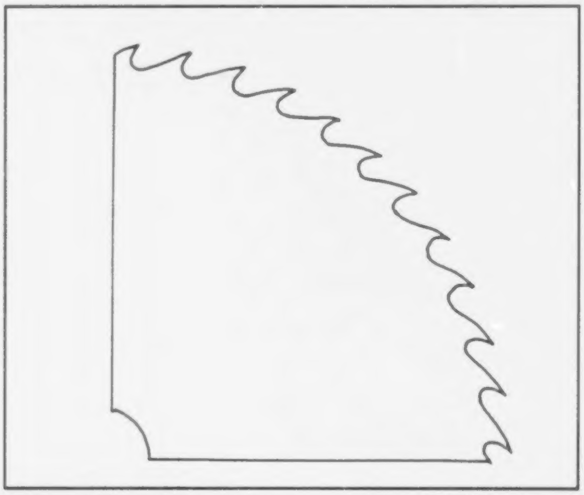
Blade size depends on saw size. Blades can range from 4 1/2 inches to 12 inches. An 8-inch saw can use a blade up to 8 inches in diameter.

Three main types of blades are used in a **portable electric saw**:

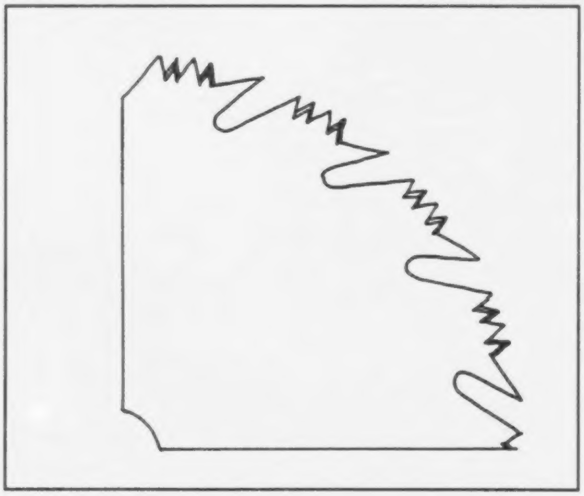
1. Crosscut - has fine knife-like teeth. Use a crosscut blade when cutting across the grain of the wood.



2. Rip - has chisel teeth. Use a ripping blade when you cut with the grain.



3. Combination - every other tooth is a chisel tooth followed by a knife-like tooth. A combination blade can be used for crosscutting or for ripping. You can also use a combination blade for making a bevel.



**DO SKILL SHEET 3**

## USING A PORTABLE ELECTRIC SAW

## SKILL SHEET 3

Choose the best answer

___ 1. This kind of blade makes a clean cut, but you have to clean and sharpen it often.
a. high-speed steel b. carbide

___ 2. This kind of blade can be used for a long time, but paying to have it sharpened can be expensive.
a. high-speed steel b. carbide

___ 3. This kind of blade is slow at cutting solid stock.
a. high-speed steel b. carbide

___ 4. This kind of blade is fragile and must be handled carefully.
a. high-speed steel b. carbide

___ 5. If you need to cut metal, plastic or masonry, you will need to buy a ___________ blade.
a. large b. special

___ 6. In order to prevent splinters, use a
a. fine blade. b. coarse blade.

___ 7. A rip blade cuts

a. across the wood grain. b. with the wood grain.
c. either way.

___ 8. A crosscut blade cuts

a. across the wood grain. b. with the wood grain.
c. either way.

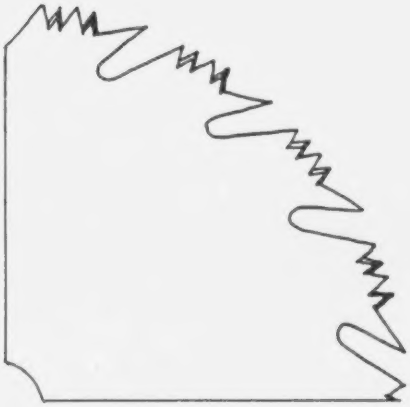
___ 9. A combination blade cuts

a. across the wood grain. b. with the wood grain.
c. either way.

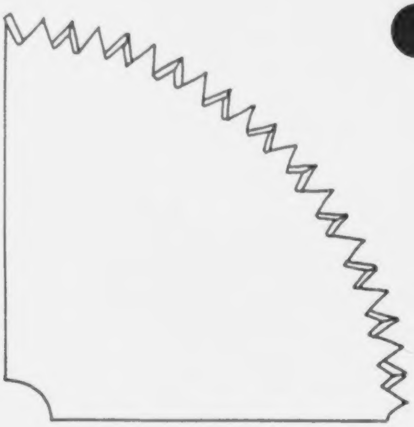
Part 2. From the list, choose the name of each saw blade.

a. crosscut b. rip c. combination

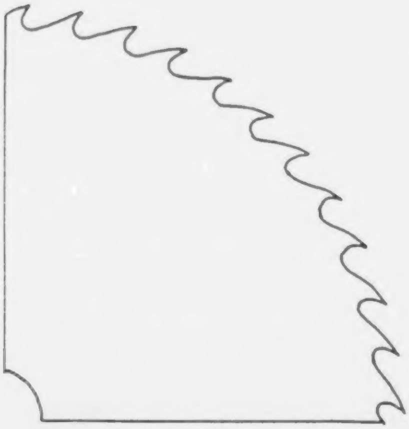
___10.



___11.



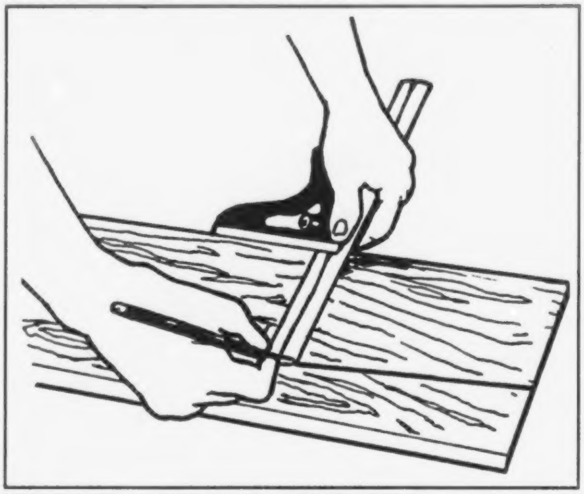
___12.



## E. HOW DO YOU ADJUST THE SAW PROPERLY?

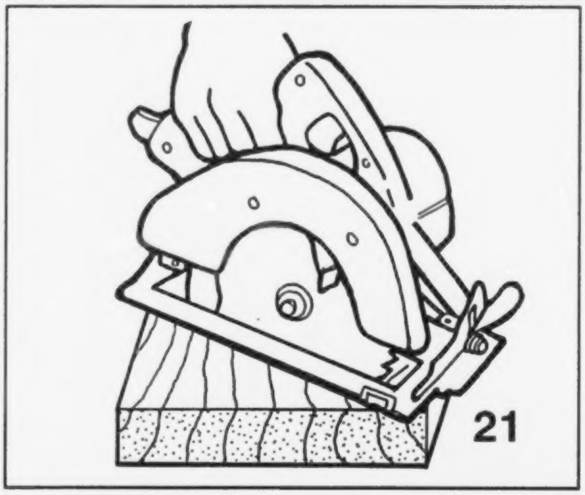
You can adjust the **portable electric saw** for a straight cut or a bevelled (angle) cut. You can also adjust it to saw deeper than the wood by about 1/8 to 1/2 of an inch ( or 6.5 to 7mm.).

A **portable electric saw** has two main adjustments: tilt and depth. By setting the tilt, you can cause the blade to slant sideways. By setting the depth, you can control how deeply the blade cuts into the stock.

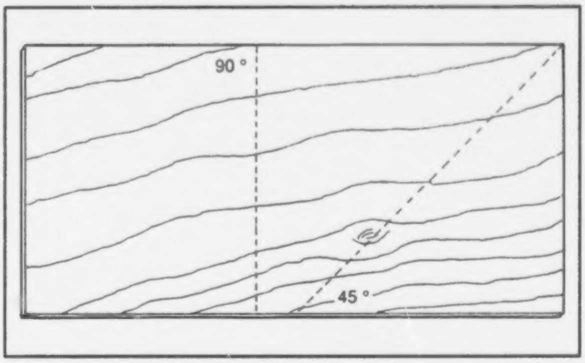


1. A 90-degree angle is like a square corner. A 90-degree angle of tilt is straight up and down if the stock is flat.

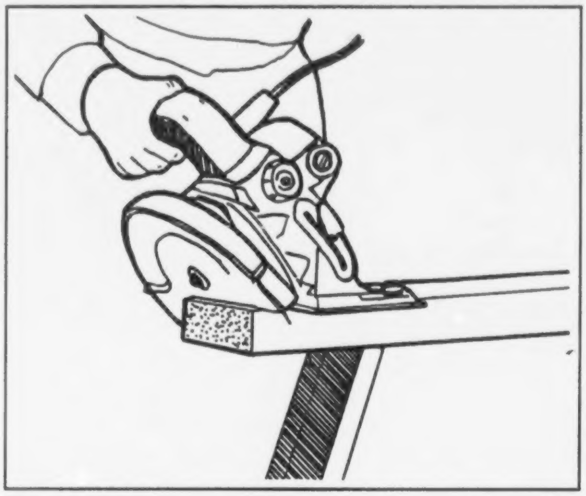
2. To **miter** the wood, set the tilt straight up and down (90-degree angle to the wood) and cut the wood catty cornered at the desired angle.



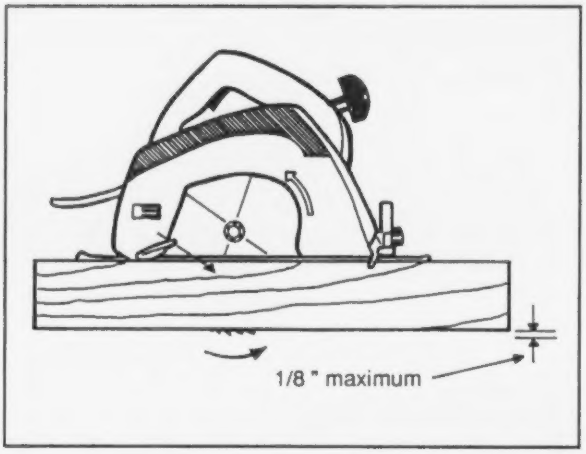
3. Half of 90 degrees is a 45-degree angle. (The smaller the number, the narrower the angle.)



4. The tilt gauge is used to saw **bevelled** (slanted) edges up to 45 degrees.



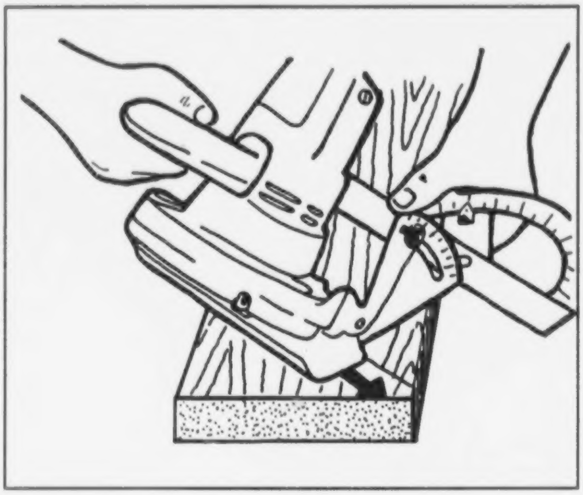
5. The depth gauge is adjusted to allow the saw to go 1/8 to 1/2 inch deeper than the stock is thick.



6. You can also do a combination **bevel** and **miter** cut.

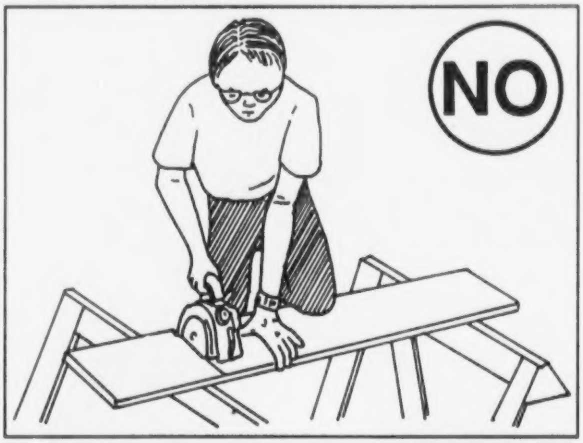
a. Set the tilt at the angle you want the bevel.

b. Cut catty cornered across the line of the angle of the miter.

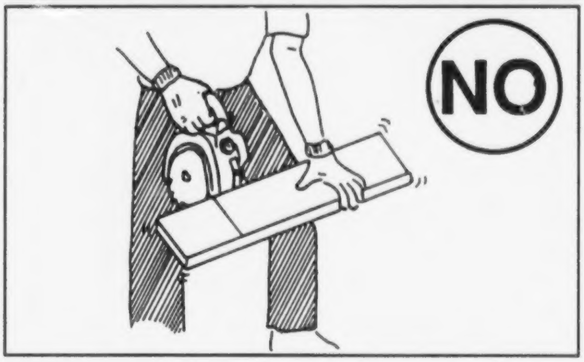


F. **HOW CAN THE WOOD BE SAFELY SECURED?**

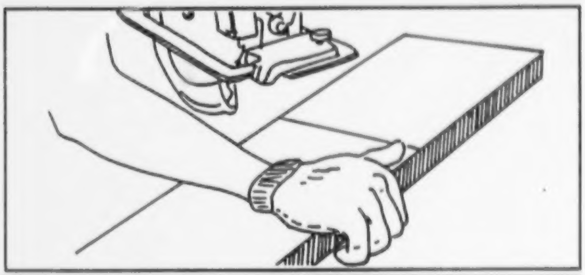
1. NEVER cut a board when the saw blade is between the sources of support.



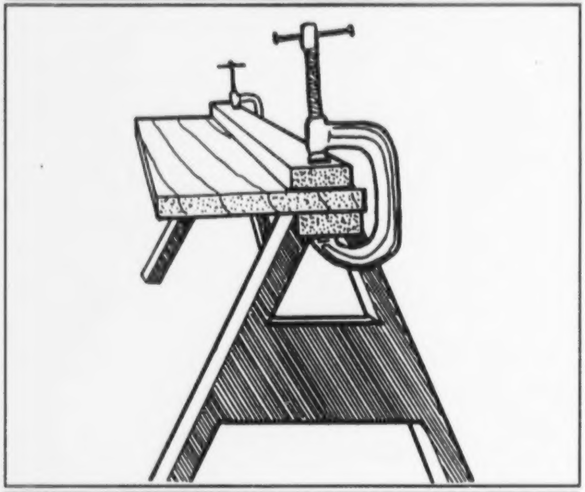
2. NEVER lay a board across your leg for cutting support.



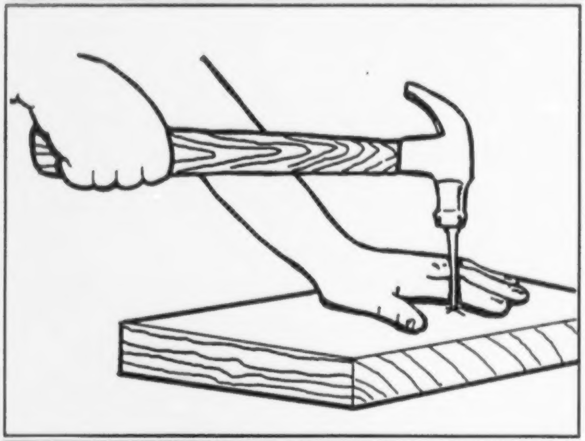
3. DO support the main stock by hand or with other supports like saw horses.



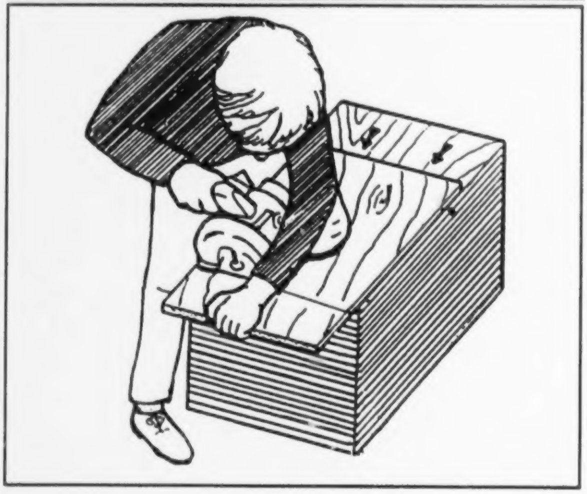
4. The piece to be cut could be CLAMPED or NAILED especially if it is short.



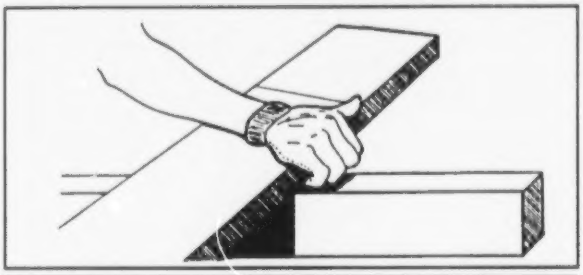
5. Be sure NOT to SAW THROUGH A NAIL OR ROCK. You could ruin the saw blade. It is also dangerous.



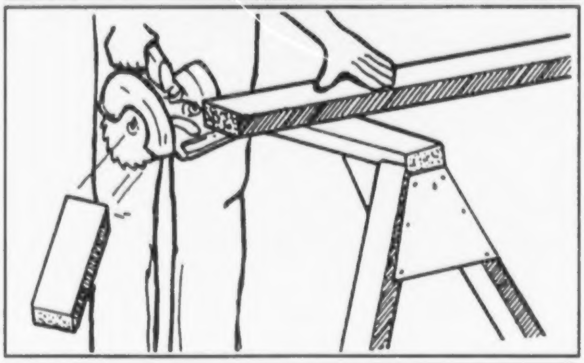
6. You can saw sheet goods like plywood by sliding the sheet slightly off the stack of lumber. The stack will support most of the plywood.



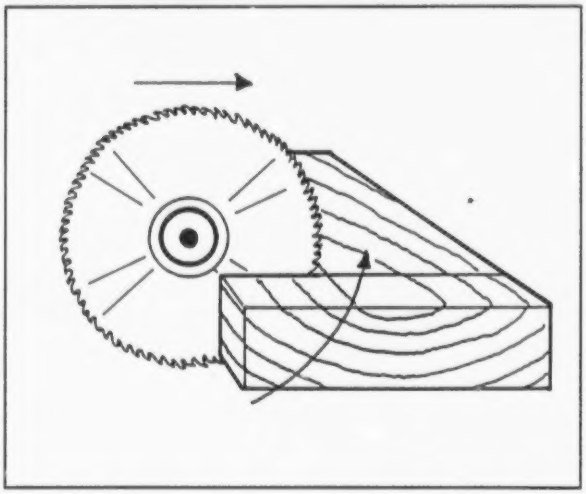
7. Sometimes you can place a 2X4 under the stock before cutting.



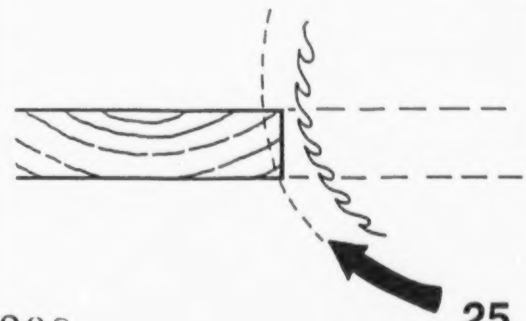
8. DO NOT support the scrap stock. Let the scrap end fall free.



9. The thinner the stock and the more shallow the cut, the more cautious you must be to prevent kick-back.



10. Realize that the saw cuts as it comes up and forward.



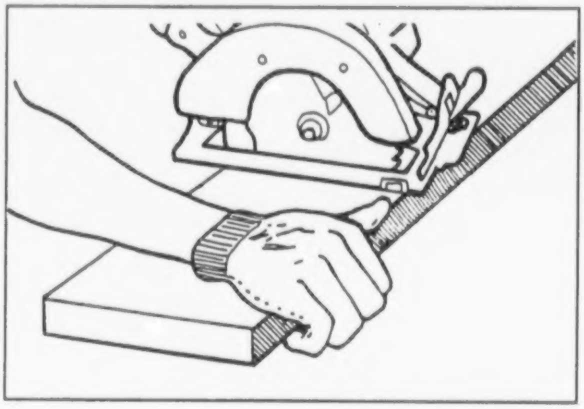
## DO SKILL SHEET 4

USING A PORTABLE ELECTRIC SAW

## SKILL SHEET 4

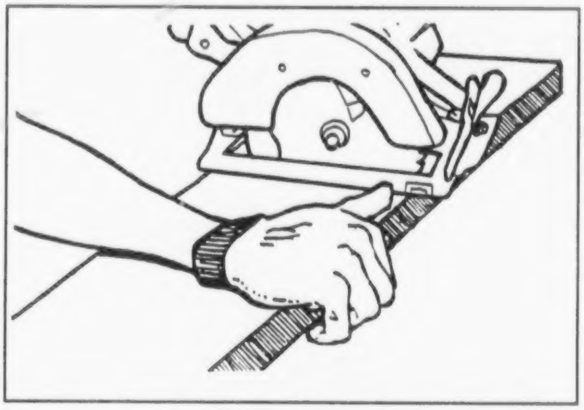
Part 1. Check the correct box under each picture.

1.



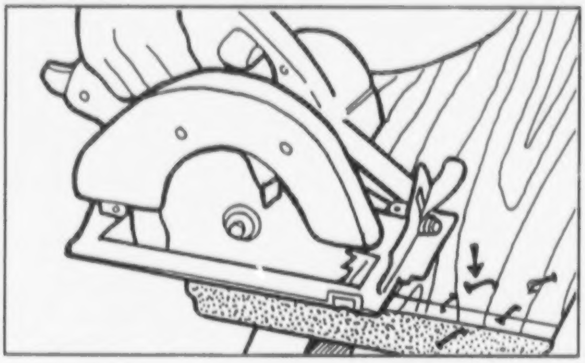
Good ☐ Bad ☐

2.



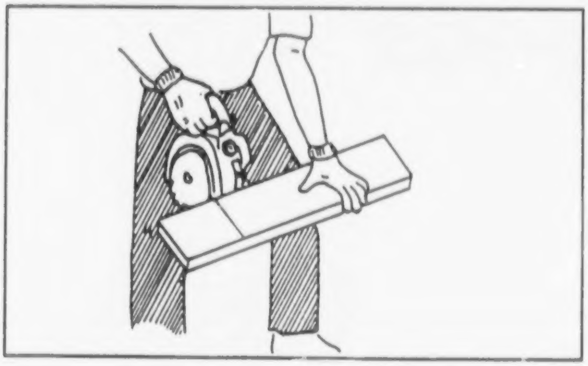
Good ☐ Bad ☐

3.



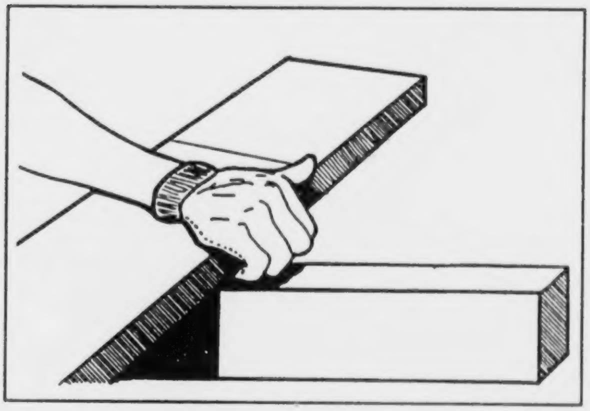
Good ☐ Bad ☐

4.



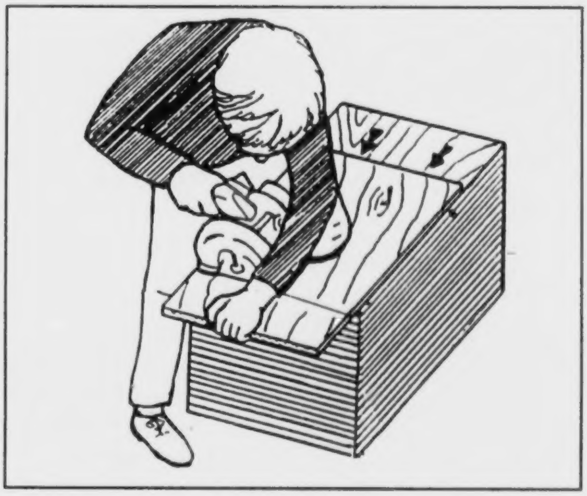
Good ☐ Bad ☐

5.



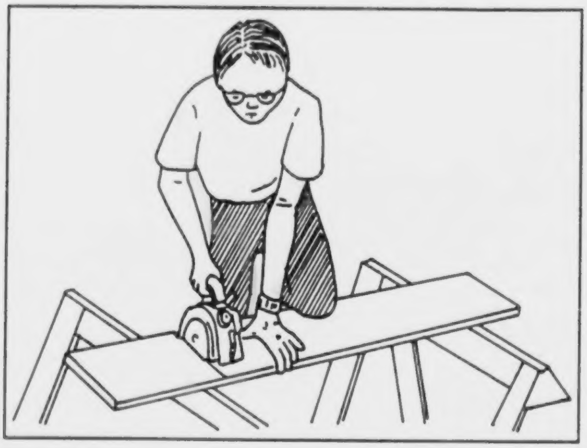
Good ☐ Bad ☐

6.



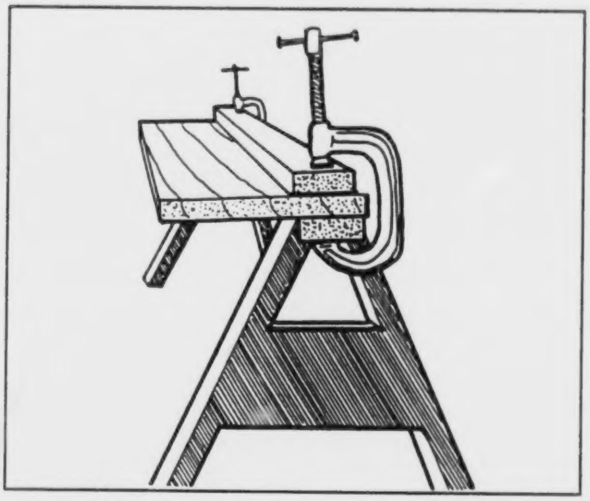
Good ☐ Bad ☐

7.



Good ☐ Bad ☐

8.



Good ☐ Bad ☐

Part 2. Choose the words that best complete each statement.

___ 9. The saw cuts as

a. it goes down and back.
b. it spins around.
c. it goes forward and up.
d. both b and c.

___10. Cut a board

a. between the sources of support.
b. on the right or left end of both supports.
c. between two clamps.
d. where it is nailed.

___11. Never

a. nail a board to support it while cutting.
b. lay a board across your leg for cutting support.
c. support the main weight of the sheet goods on a stack of wood.
d. put a 2X4 under the stock to support it for cutting.

___12. Let the scrap stock

a. fall free.
b. fall loose on a stand.
c. drop to the ground.
d. all of the above.

___13. Support the main stock securely

a. by hand.
b. with saw horses.
c. with the main part on a stack of wood.
d. all of the above.

___14. While sawing, be careful not to hit the blade on

a. a nail.
b. a rock.
c. the support.
d. all of the above.

___15. If the stock to be cut is not too short, it can be

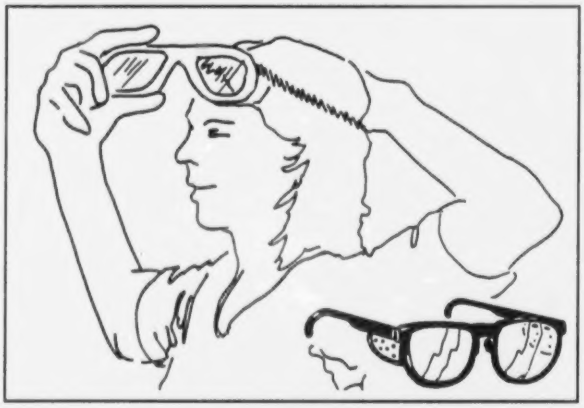
a. held by hand
b. supported on the leg
c. balanced on one end and held by hand with the other end
d. all of the above

___ 16. When cutting a 2X4, you should not

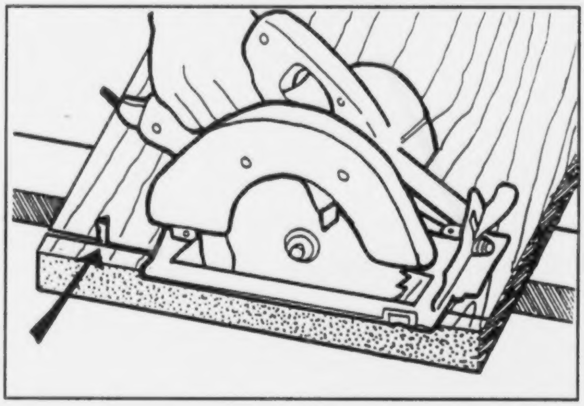
a. use saw horses
b. let the scrap fall to the ground
c. let your friend hold it near the saw
d. nail it to support it.

## G. HOW SHOULD THE PORTABLE ELECTRIC SAW BE SAFELY OPERATED?

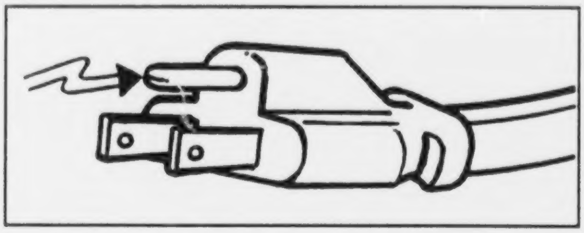
1. Wear safety glasses and clothes that will not be caught in the machinery.



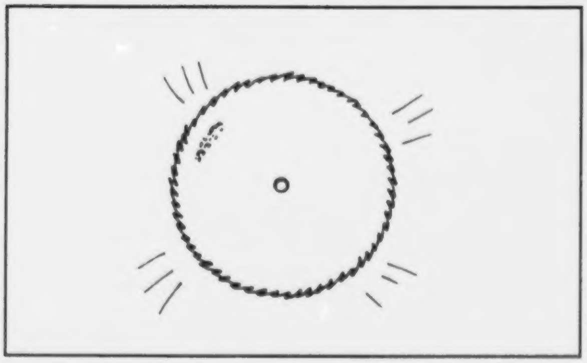
2. Prevent the stock from binding (pinching) the saw. Support the work properly. If the saw binds, you can also place a wedge in the kerf to release the bind on the blade.



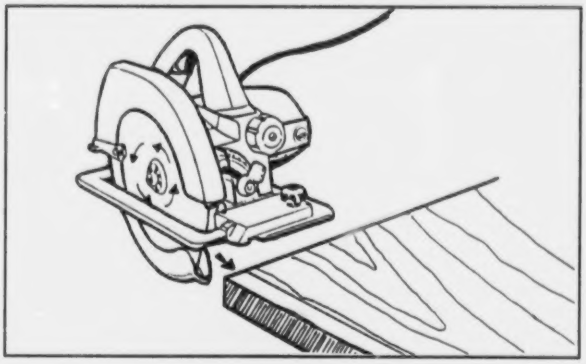
3. Check to see that the electrical connection is grounded. Ungrounded tools can result in shock hazards. A shock can be a killer.



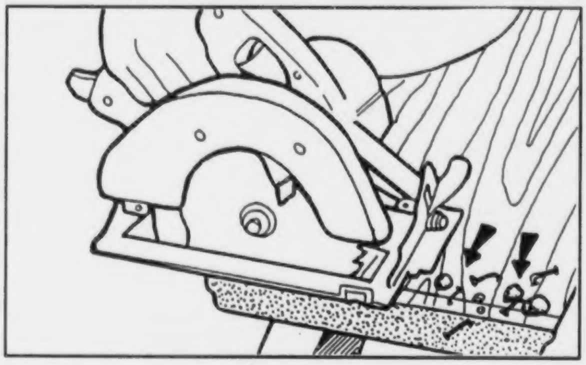
4. Make sure the blade is sharp. A dull blade may cause the saw to stall.



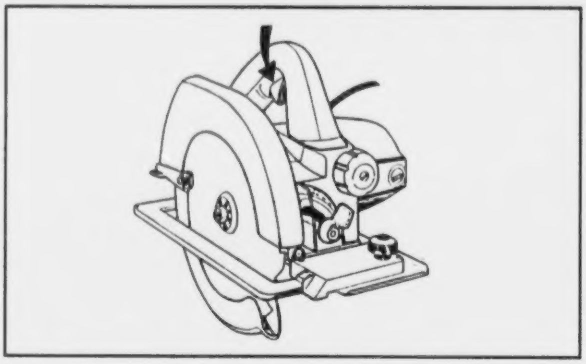
5. Start the blade full speed before touching it to the stock to be cut. Never force the saw to work.



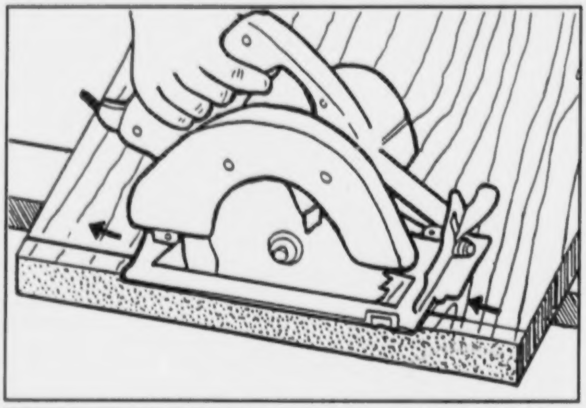
6. Be sure rocks and nails are not in the way of the blade.



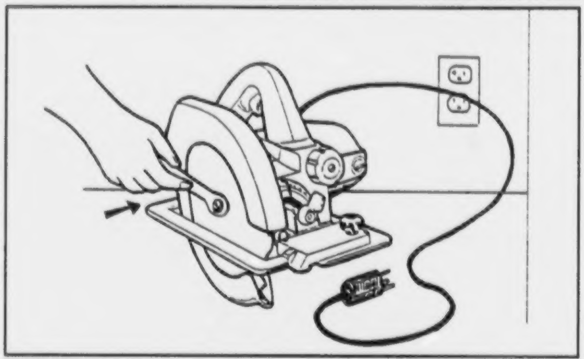
7. Check to see that the switch is off before plugging in the saw.



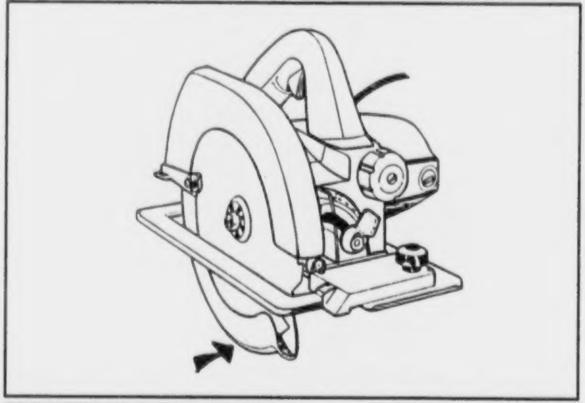
8. If the saw stalls, back the blade a little while the saw trigger switch is still on.



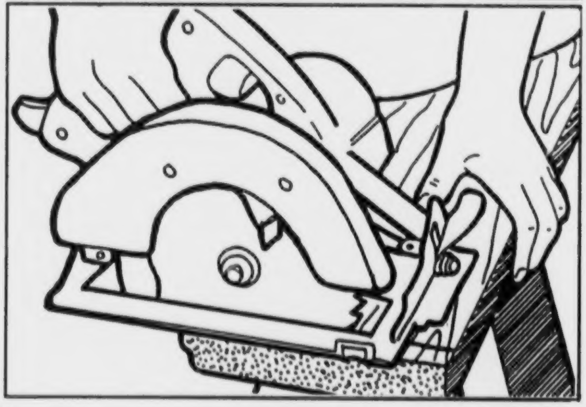
9. Tighten all adjustment screws before turning on the saw. DO NOT adjust the saw while it is working.



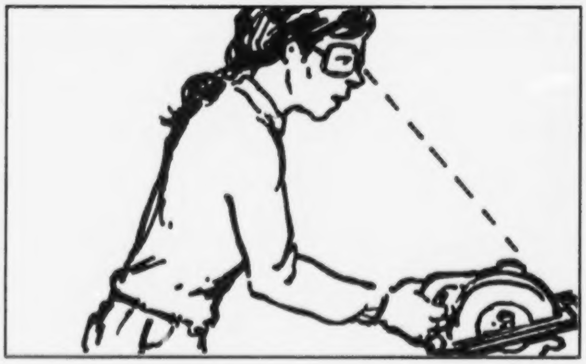
10. Be sure the blade guard is working properly.



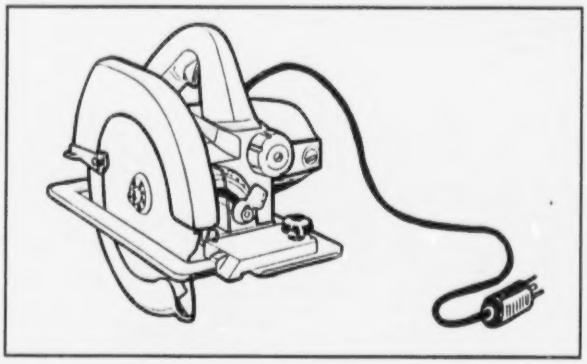
11. Do not stand in the "line of cut." If the saw binds, it can kick back and severely cut your legs.



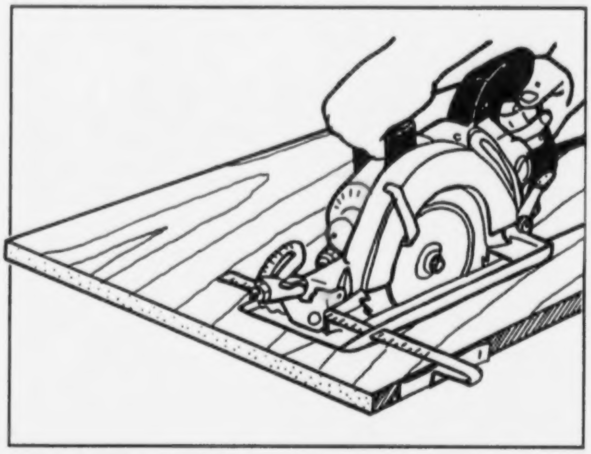
12. Do not talk to anyone or look away when you are operating the saw.



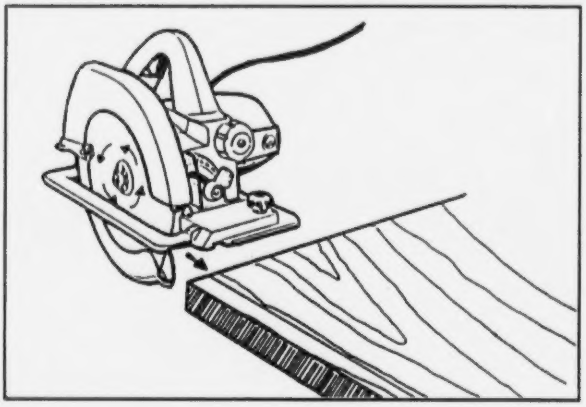
13. Unplug the saw before changing the blade. Unplug the saw any time it is not in use.



14. Hold the electric saw firmly. If possible keep both hands on the saw. If that is not practical, keep the free hand well away from the blade.

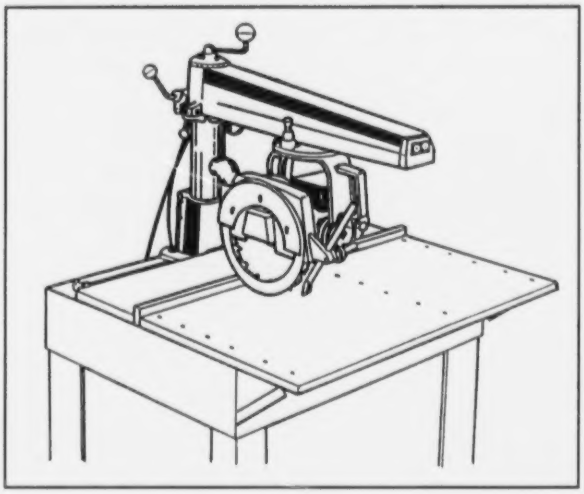


15. Plunging the saw into the middle of the wood is very dangerous. Do not do it.



16. Use a different kind of saw on very short pieces. It is too easy to get your thumb or fingers into the blade.

17. Never force the saw to work.



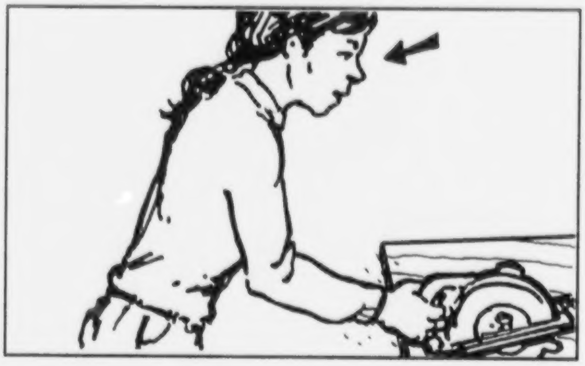
**DO SKILL SHEET 5**

USING A PORTABLE ELECTRIC SAW

## SKILL SHEET 5

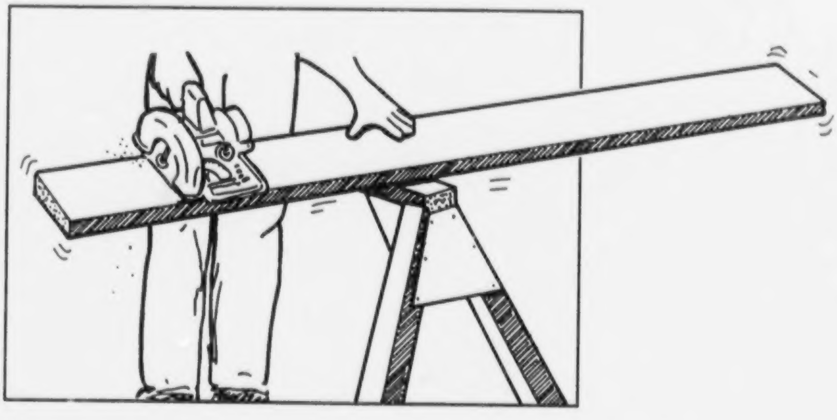
Check the correct box under each picture

1.



Safe ☐ Unsafe ☐

2.



Safe ☐ Unsafe ☐

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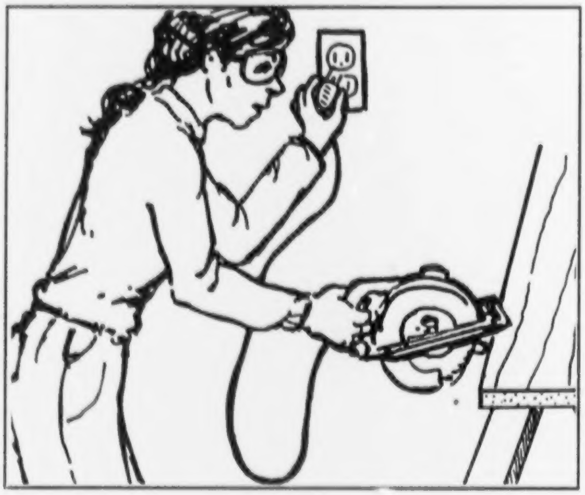
3.



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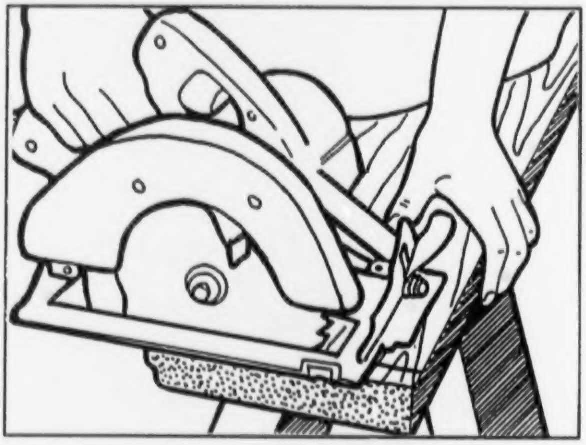

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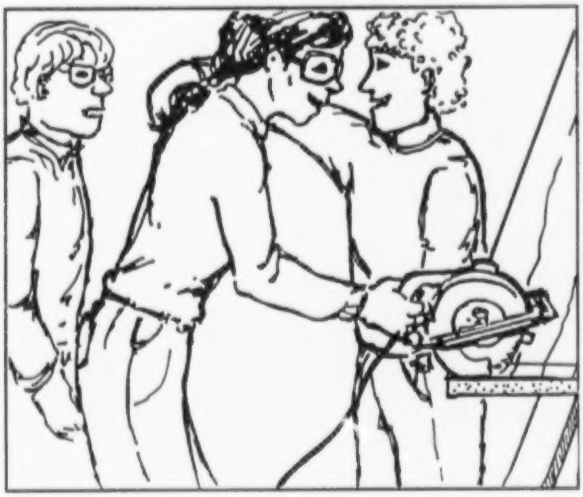

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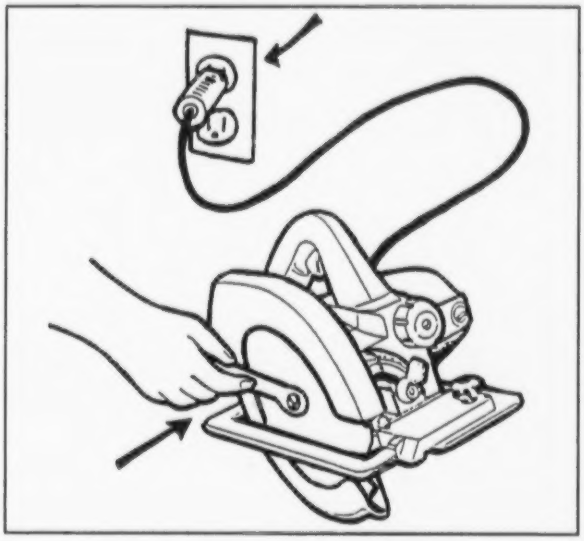

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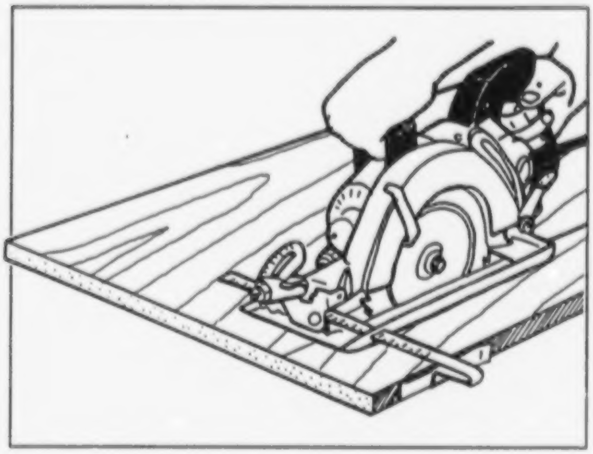

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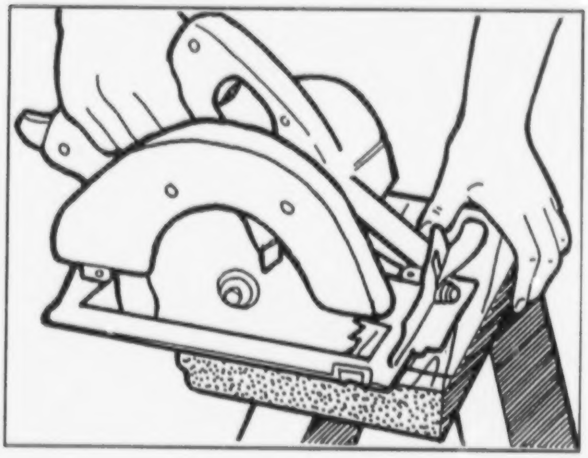

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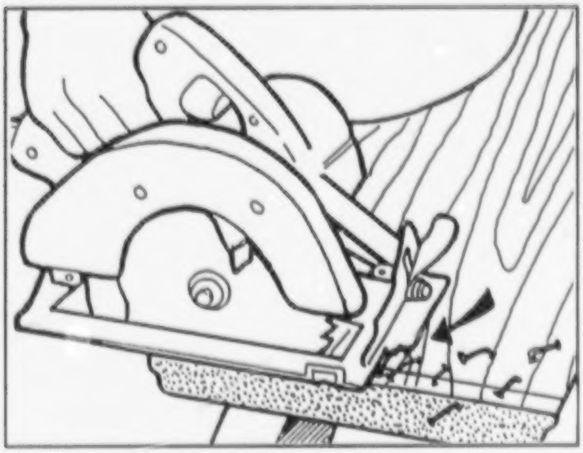
9.



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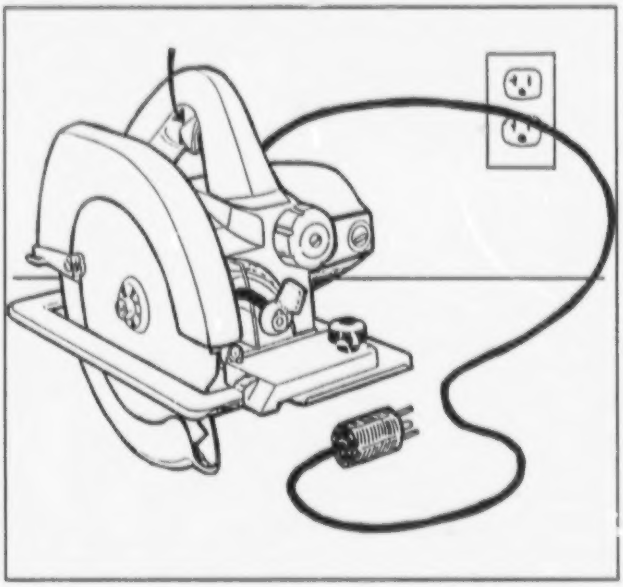

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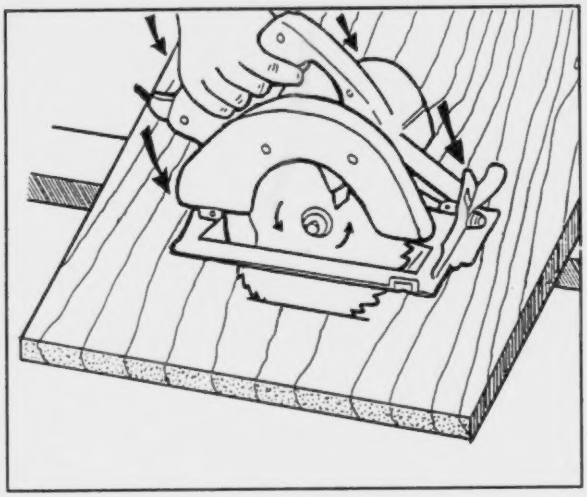
11.



Safe ☐ Unsafe ☐

315

USING A PORTABLE ELECTRIC SAW

# UNIT TEST

Part 1. Write a "T" beside statements that are true. Write an "F" beside statements that are false.

___ 1. If the saw does not saw as fast as you like, it is all right to push it harder into the work.

___ 2. Rocks and nails will not hurt the saw.

___ 3. The blade should be going full speed before you start to cut with it.

___ 4. You can wear any type of clothing while sawing with a power saw as long as you have on safety glasses.

___ 5. It is all right to talk to your friends while you are sawing because they might think you are stuck-up if you don't.

___ 6. Be sure to unplug the saw when you are not using it.

___ 7. The stock should not be allowed to bind the saw.

___ 8. Saw blades should be sharp.

___ 9. It is OK to make adjustments while the saw blade is moving.

____10. Electric tools that are not grounded can cause a serious shock.

____11. You should tighten all adjustment screws before you turn on the saw.

____12. It does not matter if the switch is on or not when you plug the saw into electricity.

____13. You can still use a saw safely even if the blade guard is not working right.

____14. It is very dangerous to plunge the saw into the center of a piece of wood.

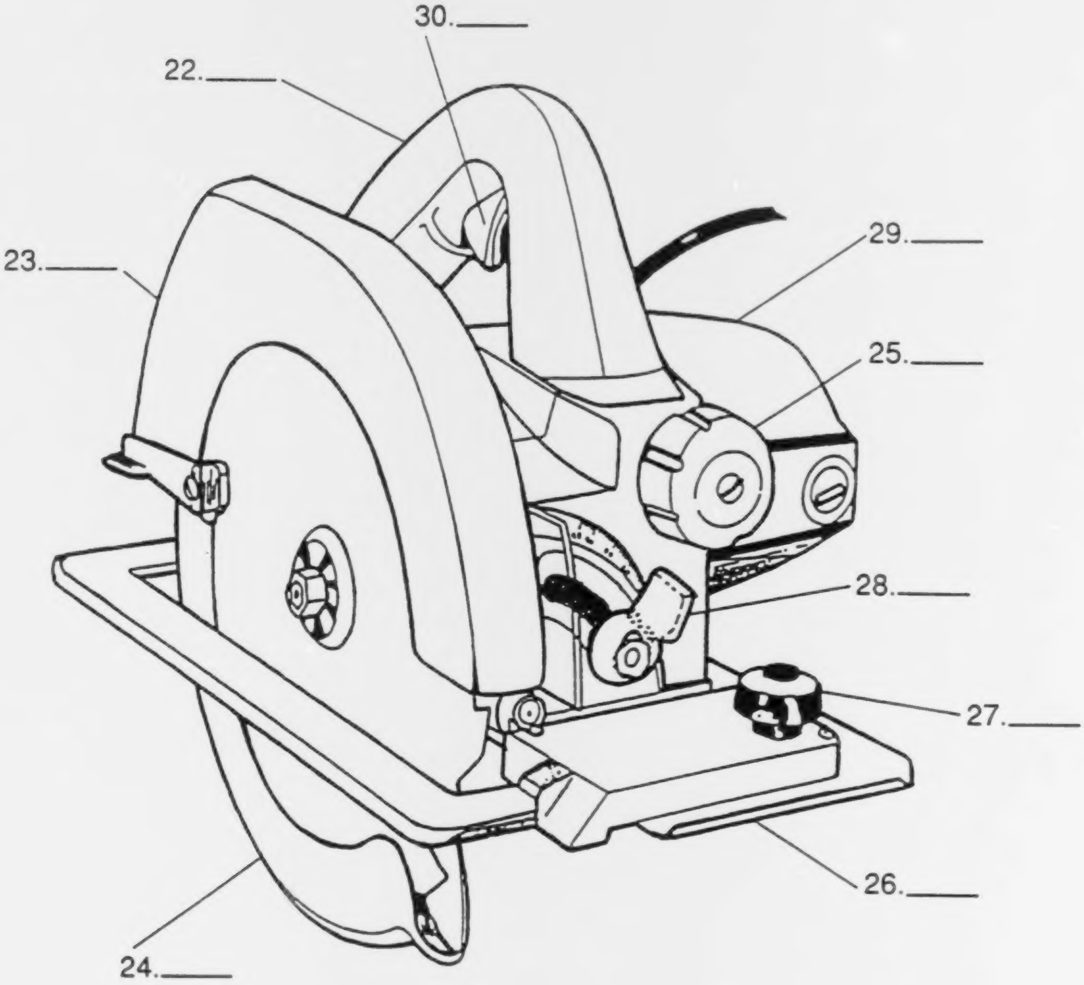
____15. Always hold a portable electric saw firmly while you use it.

____16. If the saw stalls, back the blade a little. Do this while the saw trigger switch is still pulled on.

____17. Don't stand in the line of cut when you are operating the saw.

Part 2. Choose the correct label and write its letter on the line.

a. switch
b. handle
c. shoe or base
d. hand knob
e. upper guard
f. motor
g. telescoping guard
h. tilt adjustment
i. depth adjustment



USING A PORTABLE ELECTRIC SAW

# PERFORMANCE CHECKLIST

Student____________________________successfully performed the following tasks:

| TASK | YES | NO | COMMENT |
|---|---|---|---|
| 1. Explained when using a portable electric saw is a good choice. | | | |
| 2. Matched the quality of the portable electric saw with the job to be done. | | | |
| 3. Named the parts of a portable electric saw. | | | |
| 4. Chose correct procedures for adjusting the saw. | | | |
| 5. Chose safe procedures for securing the wood. | | | |
| 6. Chose safe procedures for operating a portable electric saw. | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

________________________
Student's Signature/Date

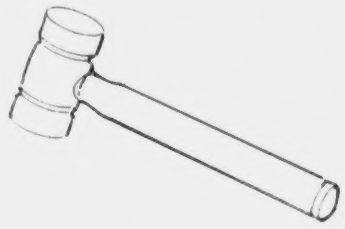
________________________
Instructor's Signature/Date

90-1400-S

# Agricultural Science I

## SUPPLEMENTARY UNITS

## Parliamentary Procedures



Instructional Materials Laboratory
University of Missouri - Columbia
Columbia, MO 65211

## INTRODUCTION

Almost everything runs by rules. Chapter meetings are no different. Chapters need rules so they can get their business finished. Chapters and organizations everywhere conduct their business using the rules of parliamentary procedure.

## OBJECTIVE

After you complete this unit, you should be able to use parliamentary procedure in chapter and committee meetings.

## STUDY QUESTIONS

After you complete this unit, you should be able to answer the following questions:

1. What is the purpose for parliamentary procedure?
2. What is the order of a business meeting?
3. What is a quorum?
4. What is main motion?
5. How is a motion processed (starting with how to obtain the floor)?

6. How is the gavel used in meetings?

7. What are different voting procedures?

**Put a check beside the statement that is true for you.**

☐ **I can do these tasks and want to go through the Performance Checklist.**

**SEE YOUR INSTRUCTOR**

☐ **I want to study the information in this unit before I do the Performance Checklist.**

**TURN PAGE AND BEGIN**

## A. TERMS

1. **Adjourn** - (ah-jurn) to close or end the meeting.
2. **Amend** - (ah-mend) to change a motion by adding, changing or taking away part of it.
3. **Quorum** - (kwore-um) the least number of members required to be present to conduct a meeting. This number is usually stated in the bylaws. Often it is a majority of the members. If only two or three people are present out of large group, their decisions wouldn't be official--wouldn't count.
4. **Majority** - (mah-jar-it-tea) more than half of the members or more than half of the members present at the meeting.
5. **Gavel** - (ga-vull) a wooden hammer that is used by the chairperson.
6. **Bylaws** - (by-lawz) written rules for the chapter or organization.

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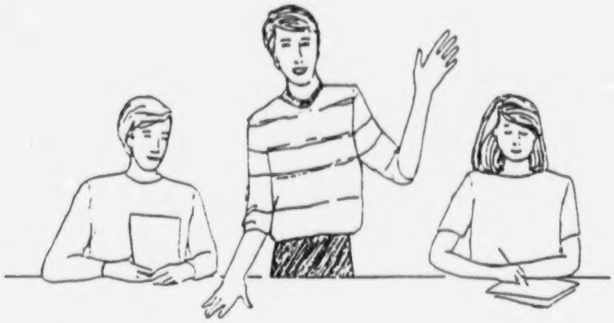
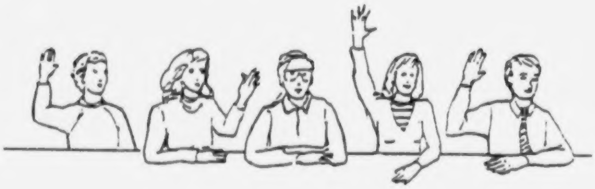
## B. WHAT IS THE PURPOSE OF PARLIAMENTARY PROCEDURE?

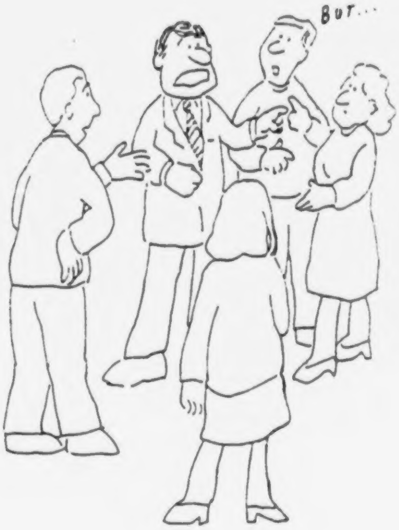
Parliamentary procedure is important for several reasons:



1. The club will be able to conduct a meeting and handle business with speed and in a business-like matter.



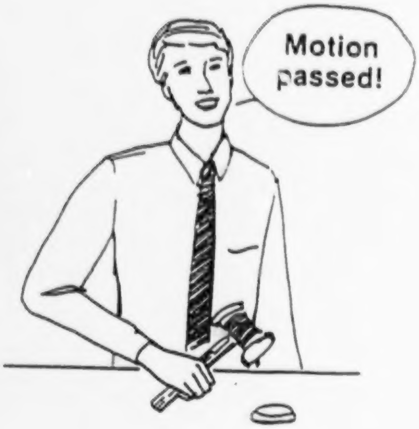
2. The **majority** will decide the business or voting.



3. All members have equal rights and responsibilities.

4. The rules ensure courtesy to all.

5. Only one item will be handled at a time.


Motion passed!

6. The chairperson must keep the meeting in order. Order helps business get done and keeps the chapter working together.

**DO SKILL SHEET 1**

## PARLIAMENTARY PROCEDURE

# SKILL SHEET 1

Choose the best answer to complete each statement.

___ 1. Using parliamentary procedure

- a. makes meetings last longer.
- b. helps get business done more quickly.

___ 2. Under rules of parliamentary procedure

- a. the majority decide what will be done.
- b. the minority (only a few people) decide what will be done.

___ 3. Parliamentary procedure makes sure

- a. everyone has equal rights.
- b. the people with the most experience make decisions.

___ 4. Using parliamentary procedure

a. promotes rudeness and name-calling.

b. helps everyone be courteous.

___ 5. Under rules of parliamentary procedure

a. only one item at a time is considered.

b. the group can discuss several items at once.

___ 6. According to the rules of parliamentary procedure

a. the chairperson keeps the meeting in order.

b. no one is really in charge.

## C. WHAT IS THE ORDER OF A BUSINESS MEETING?

The order of business for a meeting is the steps in which business is handled. Order is what is done first, what is done second, and so on.

The order of business for a meeting would include:

1. Call to order, the signal it is time to begin the meeting.

2. Secretary's report, or a reading of the minutes (what happened at the previous meeting).

3. Treasurer's report, tells how much money came in, how much went out, and the balance.

4. Reports from standing committees. These are permanent committees that always function and report.

5. Unfinished business, leftovers from past meetings.

6. New business, items to be considered for the first time.

7. **Adjournment**, time to end the meeting.

Meetings run more smoothly if everyone receives a copy of the order of business. This is called an "agenda."

**DO SKILL SHEET 2**

PARLIAMENTARY PROCEDURE

## SKILL SHEET 2

Part 1. Put the steps (order) of business for a meeting in the correct order by numbering them from 1 to 7. The first one has been done so you can see how.

___ 1. new business

___ 2. treasurer's report

___ 3. adjournment

_1_ 4. call the meeting to order

___ 5. old business

___ 6. secretary's report/reading the minutes

___ 7. reports from standing committees

Part 2. Fill in the blank.

___ 8. A copy of the order of business given to members is called an ____________ .

## D. WHAT IS A QUORUM?

An official business meeting cannot begin unless a **quorum** is present. A **quorum** is the number of members who must be present in order to conduct the business of the group legally.

The number of people in a **quorum** will be different from one chapter to another. Chapters have different numbers of members. Each chapter decides how many people form a **quorum**.

Often, a **quorum** is a **majority** of the total membership. Most organizations say in their **bylaws** how many people it takes to make a **quorum**.

One chapter may say 51% (more than half) of their members must be present in order to have a **quorum**.

If that chapter has 100 members, at least 51 must be at a meeting before a legal vote can be taken.

The meeting should not come to order unless a **quorum** is present.

**DO SKILL SHEET 3**

PARLIAMENTARY PROCEDURE

# SKILL SHEET 3

Choose the best answer to complete each statement or answer each question. Write the letter on the blank.

___ 1. Who decides how many people will be in a quorum?
   a. Congress
   b. The group
   c. The sponsor

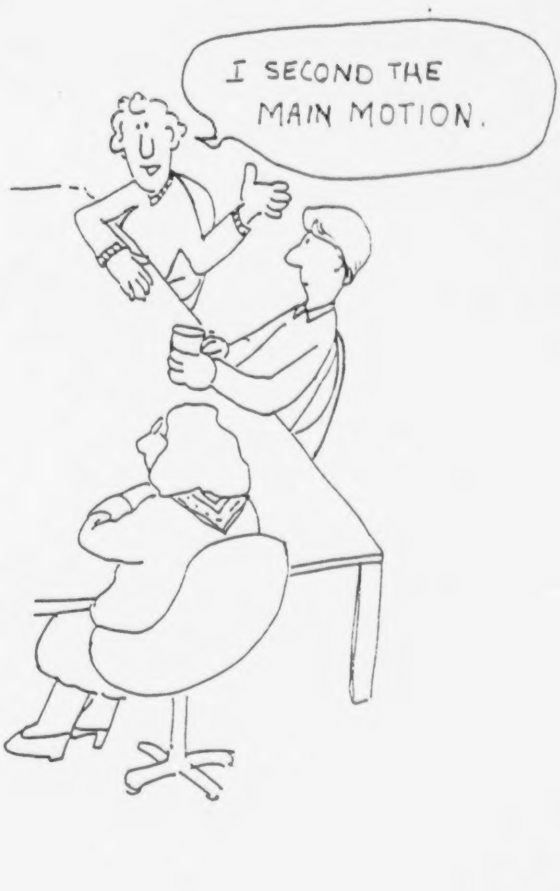
___ 2. If a quorum is not present,
   a. the group should take no votes.
   b. the group should sit in silence.
   c. the group should not come to order.

___ 3. If the bylaws say a quorum is a majority of the members and a chapter has 50 members, how many make a quorum?
   a. 26
   b. 25
   c. 24

## E. WHAT IS A MAIN MOTION?

A main motion is any new business being introduced. The only way an item of business (what someone wants the group to do) can be brought up is to state it in a motion. The only correct way to introduce a main motion is to say, "I move that..." or "I move to..."

A main motion is the vehicle to conduct business.


I SECOND THE MAIN MOTION.

1. A main motion must have someone second it. This means at least two people agree with the idea. If only one person is in favor of a motion, it dies.
2. A main motion is discussed by the group.

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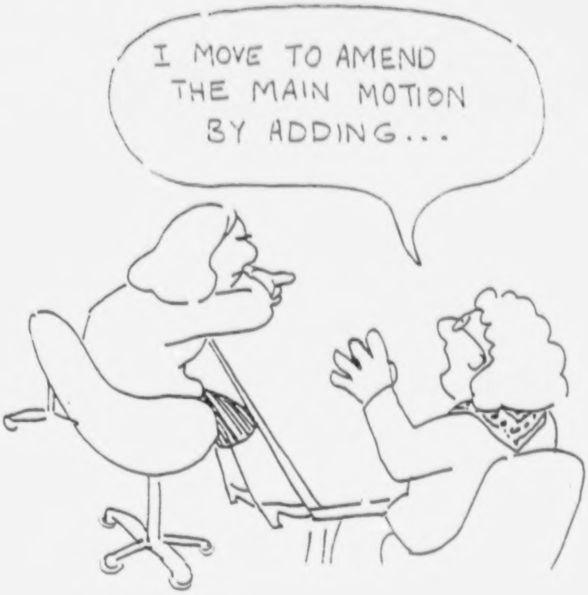
3. A main motion can be **amended** (changed).

Some examples of main motions:


I MOVE TO AMEND THE MAIN MOTION BY ADDING...

"I move that our class take a field trip to the State College Farm."

"I move that our chapter ask the high school principal to be our guest speaker."

I move that our chapter buy officer pins for the new officers."

I move that we donate $100.00 to the local telethon."

**DO SKILL SHEET 4**

PARLIAMENTARY PROCEDURE

# SKILL SHEET 4

You would like your group to do three things. You would like to

1. buy tickets to the state fair for all the members
2. have a picnic on July 4
3. donate $50.00 to the Ronald McDonald House Fund

Write a complete motion for each of these suggestions.

1.

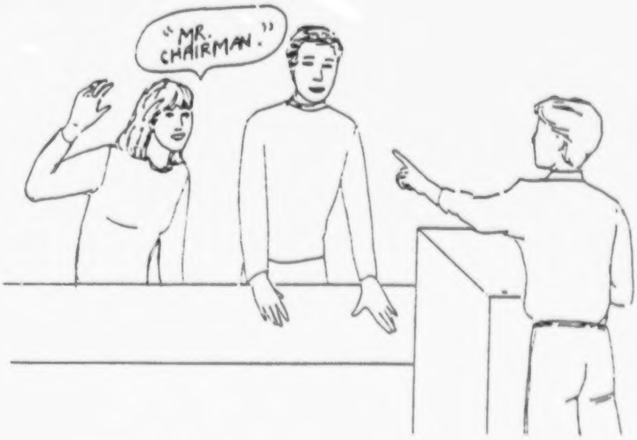
2.

3.

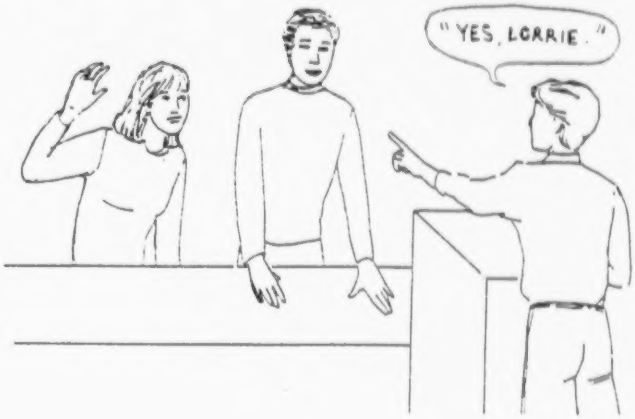
## F. HOW IS A MOTION PROCESSED (STARTING WITH HOW TO OBTAIN THE FLOOR)?

A main motion is introduced in the following way:

1. You say, "Madame or Mr. President," or whatever title the chairperson has.


"MR. CHAIRMAN."

2. You must be recognized by a nod or by the president's saying your name. This must happen before you can speak to the group.



3. You may say a few short remarks about why you are about to make a certain motion. For example, "We

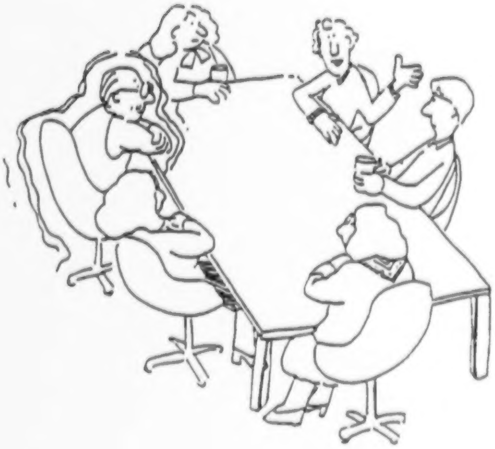
have been having trouble getting our business done. It is impossible to do the things we need to do without transportation. I move that the chapter purchase a good used car."

and then we can....

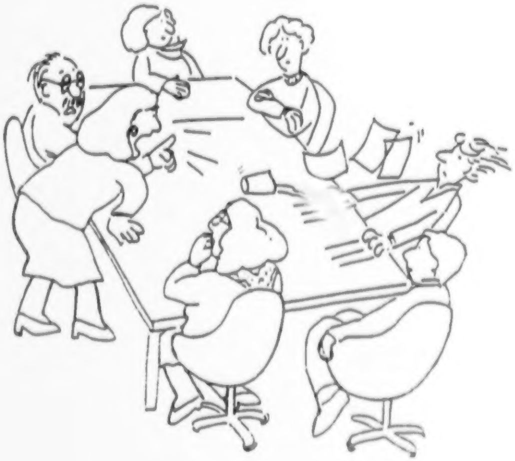
4. Another member thinks your idea is a good one and says, "I second the motion."

5. The president then tells the group, "It has been moved and seconded that the chapter purchase a good used car. Is there any discussion?"

6. Every member should be allowed to discuss this motion. They may do so by obtaining recognition (permission to speak) from the president. Although each member has the right to speak twice on the same motion, no member should be given a second turn until all members have had a chance to talk.



7. When it seems as if all members have finished discussing the motion, the president asks, "Are you ready for the question?" (That means are you ready to vote on this motion?)



8. If no one gets up to speak, the president repeats the main motion and asks the question: "It has been moved and seconded that the chapter purchase a good used car, all in favor say 'aye.' (That means yes.) All opposed say, 'no'."

9. This motion (to buy a good used car) could have been **amended** (changed). Some one could have suggested that the motion be **amended** by adding the words, "that does not cost more than $3,000" after the word car.

Or it could have been **amended** to say "to check into purchasing a good used car by forming a committee, appointed by the chairperson, and to report back at the next meeting."

10. If an **amendment** is suggested and seconded, the group votes on the **amendment** before they vote on the main motion.

**DO SKILL SHEET 5**

PARLIAMENTARY PROCEDURE

# SKILL SHEET 5

Put the steps order for how a motion is processed by numbering them 1 - 10. The first one has been done so you can see how.

___ 1. After a few short remarks, you may state the motion.
___ 2. Everyone gets a chance to discuss the motion.
___ 3. Someone may make an amendment to the motion.
_1_ 4. You ask the chairperson for recognition or permission to speak.
___ 5. The group votes on the amendment before they vote on the main motion.
___ 6. The chairperson recognizes you by calling your name or nodding.
___ 7. The main motion must be seconded before discussion begins.
___ 8. The president says "It has been moved and seconded....is there any discussion?"
___ 9. When it seems that the discussion is finished, the president asks, "Are you ready for the question?"
___10. Members vote on the main motion.

## F. HOW IS THE GAVEL USED IN MEETINGS?

The president or chairperson uses the **gavel**. It stands for the authority of the person in charge.

**One tap means:**

1. be seated
2. the end of an item of business
3. the meeting is **adjourned**

**Two taps mean**:

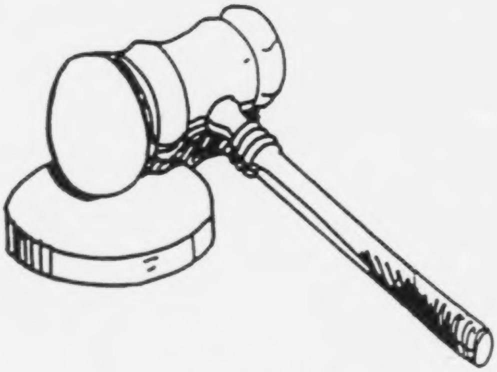
1. calling the meeting to order

**Three taps mean:**

1. members stand, but only on the third tap

**A series of taps mean:**

1. order in the meeting
2. settle down and do things in the right way



## DO SKILL SHEET 6

## PARLIAMENTARY PROCEDURE

# SKILL SHEET 6

Match the number of gavel taps with the correct meaning.

___1. Signals members to be seated A. several taps

___2. Calls the meeting to order B. one tap

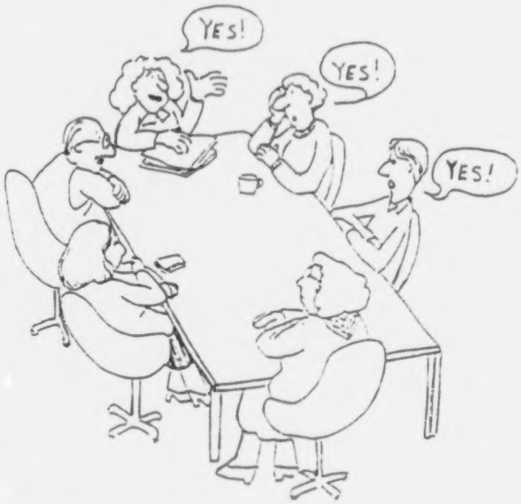
___3. Signals members to stand C. two taps

___4. Calls members to settle down D. three taps

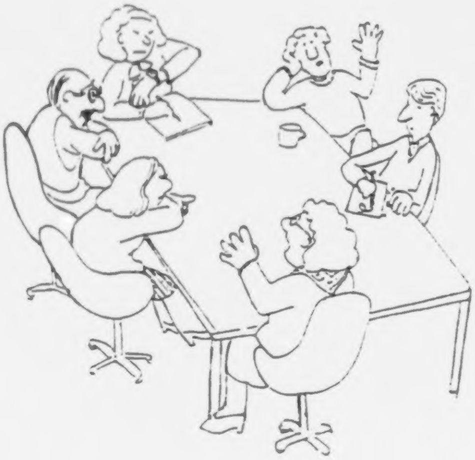
## I. WHAT ARE DIFFERENT VOTING PROCEDURES?

There are four ways to vote during a meeting.

1. By voice. Members call out "yes" (or aye) or "no" (or nay). The chairperson must judge by the sound to tell which way the vote goes. It's not a good way to vote on something people disagree a lot about.



2. By standing (or a show of hands). These can actually be counted if the vote is close. It is a quick way to take a vote.



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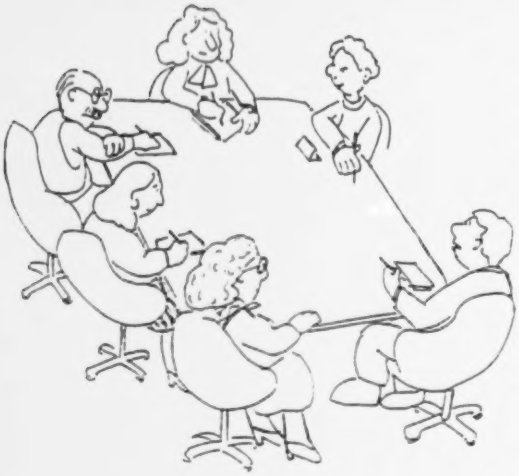
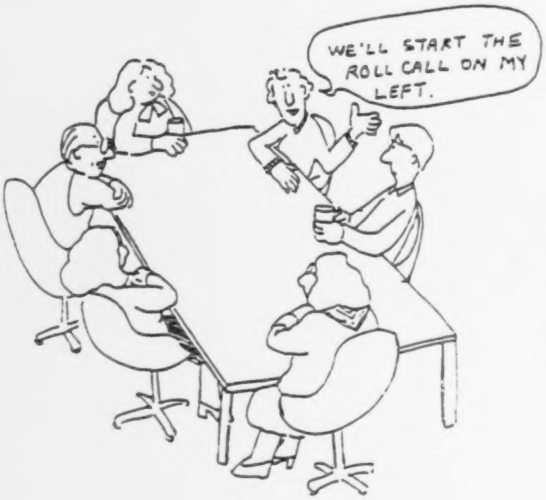


3. By secret ballot (marking on a piece of paper). This way is accurate, but it takes a lot of time.


WE'LL START THE ROLL CALL ON MY LEFT.

4. By roll call. The secretary calls each member's name and records his or her vote. If it's important to know who is for and who is against something, this is a way to know for sure. Roll call takes a long time.

**DO SKILL SHEET 7**

**DO ACTIVITY SHEET 1**

## PARLIAMENTARY PROCEDURE

# SKILL SHEET 7

Write a (T) before each true statement and an (F) before each false statement.

___ 1. Adjourn means to end the meeting.

___ 2. Majority rules in parliamentary procedure.

___ 3. Courtesy is not part of parliamentary procedure.

___ 4. All members have equal rights and responsibilities.

___ 5. Voting can be done by a show of hands.

___ 6. A main motion requires someone to second it.

___ 7. Voting can be done by a secret ballot.

___ 8. A quorum is ten people or members.

___ 9. Only one main item or motion will be handled at a time.

___10. Voting can be done by saying "yes" or "no" out loud.

___11. A main motion can not be discussed.

___12. A main motion can be amended.

___13. To make a motion, one must say, "I move that..."

___14. To make a motion, one must say, "I make a motion that..."

PARLIAMENTARY PROCEDURE

# ACTIVITY SHEET 1

Directions: Assign individual roles, then take turns reading through the sample meeting that follows.

Roles:

Instructor
President
Secretary
Treasurer
Member #1
Member #2
Member #3
Reporter

Member, Julie
Leadership committee
chairperson
Helen
Special committee chairperson
Joan
Wilfred

# A Sample Meeting

President: "Mr./Mdm. Secretary, what is our first order of business?

Secretary: "Minutes of the previous meeting, Mr./Mdm. President.

The president called the regular meeting of the__________ club to order at 9 a.m., November 3. The secretary read the minutes, which were approved as read. The treasurer reported a balance of $871.35 as of November 3. The secretary read a letter from the State Director regarding the Leadership Seminar. The president asked the officers to inform the school advisor if they would be able to attend the seminar. Reports were given by the Community Service Committee, Program Committee and Ways and Means Committee. New Business: Jeff moved to supply $25.00 for a grocery basket for a needy family for Thanksgiving. Motion carried. Meeting adjourned by president at 10 a.m.

President: You have heard the minutes of the previous meeting. Are there any additions, corrections or criticisms? If not, the minutes stand approved as read.

**Instructor interrupts to comment: I'm glad you said previous. Do not say "of our LAST meeting." That makes it sound as if there will never be another meeting. Say "previous."**

President: Thank you Mr./Mdm. Secretary. What is our next order of business?

Secretary: Officer reports, Mr./Mdm. President.

President: Are there any officer reports to be presented?

Treasurer: Mr./Mdm. President. I should like to present the monthly treasurer's report. We began the month with a balance of $871.35. Our receipts for the period were $786.42. Our disbursements totaled $411.19. That leaves a balance of $1,236.78. As the members entered the meeting room, a copy of the month's report was distributed. Mr./Mdm. President, I move the acceptance of this report.

President: Is there a second to the motion?

Member 1: I second the motion.

President: You have heard the motion and the second. Is there any discussion? If not, all in favor say "aye." All opposed say, "no." The motion is carried.

**Instructor interrupts to comment: In some meetings, the secretary will identify the one seconding a motion. By the way, you don't say "I second THAT." "THAT" was NOT the motion under consideration.**

President: Are there any other officer reports to be presented?

Reporter: Mr./Mdm. President, during the past month we have published a total of 137 column inches of news and put on one five-minute radio broadcast about our summer camp. Mr./Mdm. President, I move the acceptance of this report.

President: Is there a second to the motion?

Member 2: I second the motion.

President: You have heard the motion and second. Is there any discussion?

Julie: Mr./Mdm. President.

President: Julie.

Julie: I would like to know why the article in The National FUTURE FARMER magazine was not included in the report.

President: Will the reporter please respond to the question?

Reporter: The article was not included because it did not appear during the month covered in the report. It will be included in next month's report.

President: Is there any further discussion on this motion? Hearing none, all in favor of the motion say "aye." All opposed say "no." The motion is carried and the report is accepted.

President: Are there any other officer reports to be presented? Hearing none, Mr./Mdm. Secretary, what is our next order of business?

Secretary: Reports on chapter program of activities, Mr./Mdm. President.

President: Are there any program of activity reports to be presented?

Leadership
C. Chair: Mr./Mdm. President, this is the report from the leadership committee. After reviewing the applications, our committee recommends that Todd Jackson, Jason Erickson, Martha Mork and Donna Anderson be this year's finalists for the Star Greenhand award. I move the acceptance of our committee report.

President: Is there a second to the motion?

Member 1: I think Tommy Kawalski should be included.

Member 2: I rise to a point of order.

President: State your point.

Member 2: Since the motion had not received a second, discussion was not in order.

President: Your point is well taken. We call again for a second to the motion.

Member 3: Second

President: The motion has received a second. Is there any discussion?

Member 3: At our last meeting this committee was directed to select four finalists. It was agreed that their decision would be final.

President: Is there any further discussion? Hearing none, are you ready to vote?

Members: Question--question

President: The question has been called. All in favor, signify by saying "aye." Those opposed say "no." The motion is carried. Are there any other program of activities reports to be heard? If not, Mr./Mdm. Secretary, what is our next order of business?

Secretary: Special features, Mr./Mdm. President.

President: Our agenda indicated that there are no special features scheduled so we shall proceed to the next order of business.

Secretary: Mr.\Mdm. President, unfinished business is the next order of business.

President: Is there any unfinished business to come before the group?

Helen: Mr./Mdm. President.

President: Helen.

Helen: At the previous meeting a special committee was appointed to plan our Food for America program. What did they decide to do?

President: This should come up during special committee reports. Mr./Mdm. Secretary, is that not our next order of business?

Secretary: Yes, Mr./Mdm. President. Special committee reports are next on the agenda.

President: Are there any special committee reports to be presented?

Special C. Chair: Mr.\Mdm. President, our committee recommends that our Food for America program should be presented to elementary students on the first Monday of April with Tammy Koble as the coordinator. I move the acceptance of this report.

President: You have heard the motion. Is there a second?

Member 1: I second the motion.

President: Is there any discussion? Hearing none, all in favor signify by saying "aye." Those opposed say "no." The motion is carried. Are there any other special committee reports to be presented? If not, what is the next order of business?

Secretary: New business, Mr./Mdm. President.

President: Is there any new business to be presented?

Joan: Mr./Mdm. President.

President: Joan.

Joan: I move that our chapter purchase Student Handbooks for every first-year member in our chapter.

President: Is there a second to this motion?

Member 3: I second the motion.

President: Is there any discussion?

Wilfred: Mr./Mdm. President.

President: Wilfred.

Wilfred: I move to amend the motion by substituting the words "pay $2.00 of the cost" in place of purchase.

President: Is there a second?

Member 2: I second the motion.

President: Is there any discussion? Hearing none, all in favor of the amendment to the motion signify by saying "aye." Those opposed say "no." The amendment is defeated. Is there any further discussion on the original motion? Hearing none, all those in favor say "aye." Opposed say "no." The motion is carried. Is there any more new business to come before the meeting? Are there announcements? The meeting is adjourned.

PARLIAMENTARY PROCEDURE

# UNIT TEST

Part 1. Write a "T" beside each true statement and an "F" beside each false statement.

___ 1. Proper parliamentary procedure makes meetings far too long.

___ 2. Two taps of the gavel mean "stand up."

___ 3. When the president taps the gavel three times, all members rise at the third tap.

___ 4. If you don't like a main motion, you may just forget about it.

___ 5. Every member has a right to express his or her opinion in a meeting.

___ 6. If a quorum is not present, the chapter can still conduct business.

___ 7. The chairman nods or says your name before you may make a motion.

___ 8. The gavel is tapped two times to call the meeting to order.

___ 9. Anyone may use the gavel to get order at the meeting.

___10. The majority is always 25 members.

Part 2. Match the following terms with their meanings.

A. majority
B. secret ballot
C. minutes
D. adjourn
E. two taps
F. unfinished business
G. three taps
H. amend
I. one tap
J. motion
K. gavel
L. quorum

___11. Be seated
___12. members stand
___13. business carried over from previous meeting
___14. voting on paper
___15. number of members necessary to do business
___16. official record of business
___17. formal proposal to take action
___18. to change or improve
___19. wooden hammer used by president/chairperson
___20. calls meeting to order
___21. more than half
___22. to close the meeting

Part 3. Fill in the blank.

To make a motion, you begin by saying:

23._____________ 24._____________ 25.________

PARLIAMENTARY PROCEDURE

# PERFORMANCE CHECKLIST

Student_______________________successfully performed the following tasks:

| TASK | YES | NO | COMMENT |
|---|---|---|---|
| 1. Explained the purpose for parliamentary procedure. | | | |
| 2. Listed in order the steps in a business meeting. | | | |
| 3. Defined a quorum. | | | |
| 4. Worded main motions. | | | |
| 5. Listed the steps in processing a motion. | | | |
| 6. Explained the use of the gavel. | | | |
| 7. Defined four voting procedures. | | | |

Satisfactory - should move on ☐

Should repeat this unit ☐

______________________
Student's Signature/Date

______________________
Instructor's Signature/Date